

5. TRANSPORTATION IMPACTS OF THE PROPOSED ACTION

This chapter describes how the natural and human environment could be affected by the transportation of SNF to the proposed PFSF, and by construction, operation, and decommissioning of transportation facilities in Skull Valley that route or transfer SNF shipped from U.S. reactor sites to the proposed PFSF. In doing so, this chapter presents or references relevant data, describes the approach and methods used to predict future environmental effects, and presents an evaluation of the potential environmental impacts.

Each subsection describes, as appropriate, any potential impacts to specific categories of environmental resources. Each subsection also contains a concluding statement as to whether the potential impacts are judged to be small, moderate, or large. The standards used for these concluding statements are presented in the dialogue box on the following page. In addition to a discussion of the potential impacts, the possible mitigation measures that could be employed to eliminate or reduce the magnitude of any impacts are also presented and discussed within each subsection. Each subsection identifies certain of the possible mitigation measures that the Cooperating Agencies propose be required. See Section 9.4.2 for a complete list of the mitigation measures that the Cooperating Agencies recommend be required.

This chapter discusses the impacts of cross-country transportation of SNF (i.e., transporting SNF from U.S. reactor sites) to the proposed PFSF in Skull Valley. PFS member companies, and possibly nuclear power reactor companies that are not members, located throughout the United States could ship SNF to the proposed PFSF. This SNF would eventually be shipped to a permanent repository. Section 2.1.2.1 provides an overview of the transportation activities associated with the proposed action. Most U.S. nuclear power plants are located in the eastern part of the country, and SNF shipment from these reactors to the proposed PFSF would traverse a number of states. Therefore, the environmental impacts associated with cross-country transportation are considered in this FEIS. Because of the size and weight of the SNF shipping casks included in the PFS license application, shipment by rail is the only viable cross-country transportation option. Therefore, the focus of the cross-country transportation analysis in this chapter is on rail transportation.

In addition to cross-country transportation of SNF, this chapter also addresses the impacts of constructing and operating transportation facilities in Skull Valley. The proposed action would include the construction of a new rail siding at Skunk Ridge and a new rail line leading to the Reservation. An alternative method of local transportation is also addressed in this FEIS: the construction of an ITF near Timpie and the use of heavy-haul vehicles on Skull Valley Road from the ITF to the PFSF. Both the proposed action and the ITF alternative are addressed in this chapter. Decommissioning of the proposed transportation facilities, including rail line abandonment, is also discussed in this chapter. This discussion is based on currently available information. The NRC would not license the transportation facilities located away from the PFSF and does not require the decommissioning of those transportation facilities; those agencies responsible for transportation facility decommissioning will address that action with further NEPA documentation when those facilities are decommissioned.

Transportation of nuclear materials, including SNF is regulated by both the U.S. Department of Transportation (DOT) and the NRC. The safety of SNF shipments with respect to radiological impacts, especially in the event of a transportation accident, is ensured, in large measure, by the casks that contain the SNF. These casks must meet performance requirements specified in 10 CFR Part 71 and their design must be certified by the NRC.

Other elements of safety are provided for by the DOT's operating requirements for vehicles and drivers. These operating requirements are defined in various parts of 49 CFR.

The Surface Transportation Board (STB) thresholds for environmental analysis are contained in 49 CFR Part 1105. STB's environmental analysis of a proposed rail line covers two broad areas of impact: construction and operation. Construction-related impacts are evaluated for all new rail line constructions. Operation-related impacts are generally evaluated if the volume of traffic generated by the proposed construction exceeds STB's established thresholds.

STB's thresholds for analysis relate to both the number of trains per day and to gross ton-miles to be carried annually by the proposed rail line. Proposed rail line construction that would result in an increase of eight or more trains per day or at least a 100 percent increase in the gross ton-miles carried by the rail line would trigger the need for environmental analysis of operational impacts. Areas currently in non-attainment of Federal Air Quality Standards are subject to a stricter threshold: three trains per day, or a 50 percent increase in gross ton-miles carried.

The proposed PFS rail line would not exceed either of these STB thresholds. However, because of the hazardous nature of the cargo to be carried on the line, STB is considering potential environmental impacts along the proposed rail line and along railroad mainlines. This environmental review includes potential impacts from incident-free shipping, as well as from potential freight accidents and possible subsequent release of radioactive material.

DETERMINATION OF THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

A standard of significance has been established by NRC (see NUREG-1437) for assessing environmental impacts. With the standards of the Council on Environmental Quality's regulations as a basis, each impact is to be assigned one of the following three significance levels:

- **Small.** The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- **Moderate.** The environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- **Large.** The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

5.1 Geology, Minerals, and Soils

5.1.1 Construction Impacts

The environmental impacts to soils and geologic resources would include the loss of a portion of the soils resource, due to its physical alteration during construction, and access restrictions to economic geologic resources located beneath the proposed transportation facilities and their corridors. These alterations lead to a reduction in the soils' ability to support plant and animal life, and may possibly lead to changes in windborne erosion patterns, changes in surface water drainage and erosion patterns, and changes in infiltration characteristics. This FEIS describes the impacts to land use and the loss of vegetation and habitat in Sections 5.4 and 5.5, windborne erosion impacts in Section 5.3, surface water drainage and water erosion impacts in Section 5.2, and infiltration impacts in

Section 5.2. As discussed below, impacts to the loss of the soils resource and to economic geologic resources would be small.

The assessment for the loss of the soils resource compares the amount of soil to be lost in the construction of the proposed rail siding and the new 51-km (32-mile) rail line with the amount of similar soils resources available in Skull Valley. The assessment of impacts to economic geologic resources (e.g. aggregate) compares the estimated amount of materials required for construction with the availability of those resources in the area. It also considers the impacts to mineral resource exploitation in the immediate area of the proposed PFSF.

5.1.1.1 New Rail Line from Skunk Ridge

PFS has expressed confidence that the material generated in “cut” areas along the proposed rail line would be suitable for use in “fill” areas (PFS/ER 2001). The final design is expected to balance cut and fill areas. However, the existing soil profile would be altered during construction activities. PFS reports that approximately 95,600 m³ (125,000 yd³) of excess material would be generated from surface stripping operations in rail line construction, which would be used to stabilize side slopes (PFS/ER 2001). As discussed in Section 2.1.1.3, additional excess material [up to a total of 200,000 m³ (261,000 yd³), including the 95,600 m³ (125,000 yd³) from surface stripping operations] could also be generated. The estimated amount of spoil generated in rail construction is expected to be reduced during final design, but any excess material would be used as embankment dressing. Thus, there would be no impacts to any potential off-site fill areas or disposal sites. Soils used as slope and embankment dressing could be recoverable upon site decommissioning; thus, the soils resource would not be permanently lost. Impacts to the loss of the soils resource are therefore small.

Table 5.1 compares the amount of construction materials required in rail siding and rail line construction with the amount of material available in the area (see Section 3.1.4). The amount of sub-ballast required [172,000 m³ (225,000 yd³)] constitutes nearly 60 percent of the material available from the private sources identified by PFS [300,000 m³ (393,000 yd³)]. This would leave sufficient aggregate material available for other uses because five other locations on nearby BLM land exist where additional materials are available. A much smaller fraction (only 17 percent) of the ballast available from the private sources would be used for construction of the rail line. Thus, impacts to these economic geologic resources would be small. Mineral resources located beneath the rail siding and rail line would be unavailable for exploitation during construction. However, the impacts from this unavailability would be small due to the wide availability of similar minerals in the region.

5.1.1.2 New ITF Near Timpie

The existing soil profile at the location of the proposed ITF would be altered during construction activities. PFS reports that approximately 7,100 m³ (9,300 yd³) of excess soil (spoil) would be generated from stripping operations in ITF construction, which would be used as slope dressing (PFS/RAI2 1999). Soils used as slope dressing could be recoverable upon site decommissioning; thus, the soils resource would not be permanently lost. Impacts to the loss of the soils resource are therefore small.

Table 5.1. Comparison of transportation facility construction material requirements with quantities of materials commercially available in the vicinity of Skull Valley

Material type	Material required	Material available
Rail corridor from Skunk Ridge		
Sub-ballast	172,000 m ³ (225,000 yd ³)	300,000 m ³ (393,000 yd ³)
Ballast	73,000 m ³ (95,700 yd ³)	438,000 m ³ (572,000 yd ³)
Intermodal Transfer Facility		
Sand	880 m ³ (1,150 yd ³)	300,000 m ³ (393,000 yd ³)
Crushed rock	1,200 m ³ (1,600 yd ³)	465,000 m ³ (607,000 yd ³)
Access road base	500 m ³ (650 yd ³)	300,000 m ³ (393,000 yd ³)
Oval track base	2,300 m ³ (3,000 yd ³)	300,000 m ³ (393,000 yd ³)
Subballast	4,100 m ³ (5,400 yd ³)	300,000 m ³ (393,000 yd ³)
Ballast	3,300 m ³ (4,300 yd ³)	438,000 m ³ (572,000 yd ³)
Structural fill	2,000 m ³ (2,700 yd ³)	300,000 m ³ (393,000 yd ³)

Table 5.1 compares the amount of construction materials required for ITF construction with the amount of material available from the private sources identified by PFS. Less than 1.5 percent of the materials available from the private sources would be needed to build the ITF. Because most of this material could be recovered upon site decommissioning, impacts to these economic geologic resources would be small.

Mineral resources located beneath the ITF would be unavailable for exploitation during construction. However, the impacts from this unavailability would be small due to the wide availability of similar minerals in the region.

5.1.2 Impacts During Operations

5.1.2.1 New Rail Line from Skunk Ridge

Once the Skunk Ridge rail siding and rail line have been constructed, there would be no further impacts to soils or mineral resources during the operational phase of transporting SNF to the proposed PFSF. Extraction of subsurface mineral resources would not be permitted during operation; these resources, if any, would therefore be unavailable during the operational period. As explained above, the impacts from the unavailability of these resources would be small.

5.1.2.2 New ITF Near Timpie

Once the ITF has been constructed, there would be no further impacts to soils or mineral resources during the operational phase of transporting SNF to the proposed PFSF. Extraction of subsurface mineral resources would not be permitted during operation; these resources, if any, would therefore be unavailable during the operational period. As explained above, the impacts from the unavailability of these resources would be small.

5.1.3 Impacts at the Alternative Site B

5.1.3.1 New Rail Line from Skunk Ridge

As discussed in Section 5.1.1 above, impacts to the soils resource or to economic geologic resources would be small. The rail line to Site B would be approximately one mile longer than to Site A and would involve about 10 ha (24 acres) of additional land, thereby increasing the impact to soils resources. However, the impacts to the soils or economic geologic resources would not differ significantly from those for Site A.

5.1.3.2 New ITF Near Timpie

As described in Section 5.1.2, once the ITF has been constructed, there would be no further impacts to soils or mineral resources during the operational phase of transporting SNF to the proposed PFSF. This conclusion would apply to the proposed facility located at either Site A (i.e., the proposed site) or the alternative site (Site B).

5.1.4 Mitigation Measures

5.1.4.1 New Rail Line from Skunk Ridge

Soils (spoils) used during construction of the rail line from Skunk Ridge for slope dressing could be recoverable upon facility decommissioning and therefore are not lost. Economic geologic resources (e.g. aggregate) used in construction are similarly recoverable. Based on this assessment of the impacts to soils and economic geologic materials, no mitigation measures were identified that would appreciably reduce the effect to these resources.

5.1.4.2 New ITF Near Timpie

Similar to the new rail line, soils and aggregate materials are recoverable upon facility decommissioning, and no mitigation measures were identified that would appreciably reduce the effect to these resources.

5.2 Water Resources

Transportation facilities that may be constructed in association with the proposed PFSF include the 51-km (32-mile) long rail line along the western edge of Skull Valley and the ITF near Timpie. This section discusses hydrological impacts that could result from construction and operation of these two transportation options.

5.2.1 Construction Impacts

5.2.1.1 Surface Water

This section discusses impacts to the surface water system from transportation facility construction, including effects of channel modifications and impacts of flooding during construction.

New rail line from Skunk Ridge. As discussed below, small impacts related to surface water would occur from construction of the rail line from Skunk Ridge. The rail line would be constructed along a route near the base of the Cedar Mountains along the western edge of Skull Valley. The rail route would cross approximately 32 arroyos that would require the installation of 110 culverts (PFS/ER 2001). During construction, soils in and around the channel crossings would be disturbed temporarily and could lead to increased erosion and siltation in the vicinity of the construction site during periods of rainfall or snowmelt. Use of BMPs during construction, as planned by PFS, would control erosion and siltation during construction under normal weather conditions for the area. Potential impacts under flood conditions during construction are discussed in Section 5.2.1.2. BMPs for erosion control measures would mitigate the small impacts related to surface water along the rail line during construction. Pursuant to 40 CFR 122.26, PFS would be required to obtain a UPDES permit to protect surface waters from pollutants that could be conveyed in construction-related storm water runoff and would be required to prepare a Stormwater Pollution Prevention Plan because the construction of the rail line would disturb more than 0.4 ha (1 acre).

New ITF near Timpie. Impacts to the surface water system related to construction of the ITF would be small because the facility would have no interaction with the surface water system. The ITF would be located approximately 2.9 km (1.8 miles) west of Timpie in the area north of I-80 and south of the mainline railroad. The site occupies a small elevated area with no surface water drainage channels crossing the area. Construction activities would result in stock piles of disturbed soil that could lead to increased erosion, siltation, and sediment under normal weather conditions. Construction BMPs would be capable of controlling erosion and siltation of adjacent areas. Pursuant to 40 CFR 122.26, stormwater runoff from the proposed ITF construction site would be controlled under a general permit (i.e., UPDES) with the State of Utah. The UPDES permit is required because the construction of the ITF would disturb more than 0.4 ha (1 acre) (see Section 1.6.2.3).

Impacts to surface water quality. Impacts to surface water quality from construction of the transportation facilities would be small. Foreseeable effects on surface water quality during construction include (1) a spill of vehicular fuel into a surface water channel that contained flowing water, (2) the possible presence of motor oils and grease from construction equipment, and (3) a possible increase in sediment that could affect the quality of surface water runoff from the construction sites. The potential for a spill into a flowing surface water channel along the rail line is considered low because the flow channels involved along the rail line are dry arroyos for much of the year. The potential for surface channel contamination to occur at the ITF site is nearly nonexistent because no surface water flow channels cross the site. In any event, runoff from the rail line or ITF would be controlled under the UPDES permit.

5.2.1.2 Potential Impacts of Flooding

This section discusses impacts from flooding during construction, should such an event occur.

New rail line from Skunk Ridge. Impacts from flooding during construction of the rail line could be moderate, but the probability of such an occurrence is low. In the event that severe storms occurred during construction activity, there could be erosion of soil from the railroad embankment with consequent redeposition of soil in the downstream channels. Although PFS would use construction BMPs, a severe flood could overwhelm the capability of standard practices to control surface water flows in arroyos draining the Cedar Mountains. The severity of such an impact would vary with the storm intensity. Should severe flooding occur (i.e., storms associated with the 100-year flood event or greater), the eroded materials from the construction site would be commingled with natural sediment

transported in the flood flows from areas adjacent to the rail line. The eroded material from the construction site would not cause a significant increase in impacts beyond those caused by natural sediment transport resulting from such an event.

New ITF near Timpie. The ITF would be on a slight topographical rise, approximately 2.9 km (1.8 miles) west of Timpie in the area north of Interstate 80 and south of the existing mainline railroad. The existing elevation of the ITF project area is from 1286.6 to 1288.1 m (4220 to 4225 ft). The ITF itself would be designed nearer the 1289 m (4225 ft) elevation. In 1986 the Great Salt Lake flooded to an historic elevation of 1284.1 m (4211.85 ft), which is well below the ITF area elevation. In addition, the Great Salt Lake Planning Project Draft Analysis of Proposed Management Alternatives, issued by the State of Utah Department of Natural Resources in January 1999, has designated the flood plain of the lake at 1284.15 m (4212 ft) for planning purposes and 1285.7 m (4217 ft) as the extent of the lake's floodplain (PFS/RAI2 1999e). Neither elevation is above the ITF design elevation. In the event that weather cycles similar those that occurred in the early to mid 1980s were to recur, and if the level of the Great Salt Lake were to rise, it would take several years to affect the ITF site. Between 1983 and 1986 the level of the Great Salt Lake rose about 3.7 m (12 ft). There would be ample time to remove any spent fuel in shipping casks from the ITP in the event that the level of Great Salt Lake approached flood levels during the lifetime of the facility.

Intense precipitation events could result in increased stormwater runoff at the ITF construction site. This could result in excessive waterborne erosion of spoil piles or piles of construction aggregate. Should severe flooding occur (i.e., storms associated with the 100-year flood event or greater), the eroded materials from the construction site would be commingled with natural sediment transported in the flood flows from areas adjacent to the ITF. The eroded material from the construction site would not cause a significant increase in impacts beyond those caused by natural sediment transport resulting from such an event. Otherwise, flood-related impacts during construction of the ITF would be small because the facility would be constructed in an area with little to no flooding. This stormwater would be controlled under a UPDES general permit with the state of Utah (see Section 1.6.2.3).

5.2.1.3 Water Use

This section discusses the water use and impacts related to construction of the transportation facilities.

New rail line from Skunk Ridge. Water use impacts related to construction of the rail line would be small. Construction of the rail line would require approximately 625 m³/day (165,000 gal/day) of water during the 15-month construction period [totaling approximately 279,031 m³ (74 million gallons)] for dust control and to provide water for soil compaction (PFS/ER 2001). This water would be acquired from an offsite source and trucked to the site. As discussed in Section 4.2, PFS has determined that at least one private source of water exists from which water of the required quantity and quality could be purchased to support project construction. Use of water from private supplies would not adversely affect water availability in the area. Water required for concrete culvert construction would be a small volume compared to the overall project water requirement (PFS/ER 2001). Bottled drinking water from offsite sources would be provided for construction workers. Drinking water for personnel during operations would be provided from the PFSF.

Additional quantities of water would be required for the planned revegetation of disturbed areas along the rail corridor and would be acquired from private off-site sources. The volume of water needed is dependent upon the method used to revegetate the area. The water requirements will be determined

during the development of a final revegetation plan. Therefore, no estimate is available at this time as to how much water would be needed for this purpose. The criteria that would need to be implemented to ensure successful revegetation are described in Section 4.4.5.

New ITF near Timpie. Impacts related to water use from construction of the ITF would be small. Water required for dust control during construction of the ITF is estimated by PFS to be approximately 71 m³/day (18,800 gallons/day) during the construction period and the water would be acquired from offsite sources and trucked to the site. The construction period for the ITF would be approximately 1 year, and the maximum water volume that would be used during this period, based on the available information, would be about 25,300 m³ (6.9 million gallons). As discussed in Section 4.2, PFS has determined that at least one private source of water exists from which water of the required quantity and quality could be purchased to support project construction. Use of water from private supplies would not adversely affect water availability in the area. Concrete for the gantry crane foundation would be mixed at the batch plant at the proposed PFSF site and water required for this concrete [about 9 m³/day (2,400 gal/day)] for a short period of time would be obtained at the proposed PFSF site. This small amount of water would not adversely affect groundwater usage.

5.2.1.4 Groundwater

Impacts that could occur to groundwater are expected to be small as a result of construction of the transportation facilities. Groundwater could be affected by stormwater runoff from the site during construction; however, the proposed construction activities would not increase the quantities of runoff. The presence of motor oils and greases from construction equipment, as well as increased sediment, could affect the quality of the runoff, but because small quantities of runoff would be involved, the overall impacts to groundwater quality would be small.

The only foreseeable event that could impact groundwater quality during construction of the rail line would be a large accidental spillage of vehicular fuel used by construction equipment for which no mitigative cleanup actions were taken. Although a detailed groundwater investigation has not been performed at the proposed ITF site, the expected depth to groundwater beneath the site after construction would be approximately 7 m (21 ft). It can thus be assumed that an uncontained spill of fuel or other liquid contaminant source at the site could reach the groundwater table at the ITF site. Groundwater quality at the ITF site has not been determined; however, it is likely saline because of the proximity to the Great Salt Lake. Should a spill occur without mitigation resulting in contamination of groundwater at the ITF there could be adverse effects to aquatic/wetland habitats downgradient toward Great Salt Lake. The Cooperating Agencies propose to require that PFS prepare a Best Management Practice Plan to address the impacts from spills for the transportation facilities, including the ITF.

5.2.2 Impacts During Operations

5.2.2.1 Surface Water

This section discusses impacts related to surface water from operation of the transportation facilities including impacts that would be expected under normal climatic conditions and impacts related to flooding.

New rail line from Skunk Ridge. Under normal weather conditions, the impacts related to the surface water hydrological system from operation of the rail line would be small. Small local changes

in the flow channels would have occurred as a result of construction of the rail corridor and its associated culverts. These culverts would be sized and aligned so as to minimize the significance of any changes to the natural drainage channels. During operation of the rail line, these culverts would intermittently carry water from rainfall and snowmelt. Under normal weather conditions in the area, some sediment accumulation upstream of the culverts could occur after stormflow events, altering channel morphology. Downstream scour can be minimized through use of rip-rap at sites where rapid flow velocities would occur at culvert outlets. An applicant may develop design packages that include criteria that specify flow velocity thresholds requiring rip-rap to be placed at culvert outlets. Under normal conditions, these features would prevent erosion downstream of the culverts. PFS has designed culverts along the corridor to carry the precipitation from a 100 year flood event (Donnell 1999).

New ITF near Timpie. Under normal weather conditions, the impacts related to operation of the ITF would be small because all activities would occur inside a building and there would be no interaction with surface water. During operation of the ITF, stormwater runoff from the site would be controlled. Because of the types of impervious surfaces (i.e., buildings, asphalt, concrete) at the proposed ITF, runoff quantities would be expected to increase at the site but not to a significant extent. Also, the presence of motor oils and grease from vehicles could result in a degraded quality of this runoff as compared to what exists at the site now. These impacts, however, are expected to be small considering the small quantity of oil and grease expected to be present and the small amount of runoff that would be involved.

Impacts to surface water quality. Surface water quality impacts related to operation of the transportation facilities would be small. No permanent surface water bodies exist near the transportation facilities and therefore, under normal weather conditions, there would be no impacts to perennial surface water features. Seasonal surface water flows would occur along the rail line and an accidental spill of locomotive fuel near one of the channel crossings could occur but would be an unlikely event. Should such a spill occur during a season when surface water was present in channels along the rail route, emergency response could intercept and clean up the spill, contaminated surface water, and contaminated soils to mitigate the incident.

5.2.2.2 Potential Impacts of Flooding

This section describes the impacts to the hydrologic water system related to the transportation facilities that could result from flooding during operations.

New rail line from Skunk Ridge. Impacts that could occur to the surface water system along the rail line in the event of major flooding would be small. The presence of the rail line is not expected to increase flooding downstream but may slightly reduce peak flows downstream during high flows because of temporary pooling of water upstream of culvert inlets. PFS's design for culverts at arroyos along the rail line would accommodate flows up to and including those expected in a 100-year flood without overtopping the embankment. The design incorporates rip-rap to prevent or minimize erosion and scour below culvert outfalls under high flow conditions.

Flows in excess of the 100-year flood could result in overtopping of the railroad embankment at one or more locations. Such an event would possibly erode a portion of the embankment and could contribute to downstream siltation. Such a severe flood could also be accompanied by mudflows or debris flows from the upper arroyos in the Cedar Mountains. Mudflows or debris flows would likely plug the culverts and would accumulate in the area upstream from the railroad embankment. Large

flows could cover the railroad and block rail access to the PFSF site until their removal. This event is considered to have a low impact, because it would be a natural event and would not be triggered by the presence of the rail line. If such an event occurred, there would be abundant natural damage in the area and the incremental contribution from material eroded from the railroad embankment would be minor in comparison to the naturally derived flood debris.

Similarly, culvert blockage could result from windblown debris (such as tumbleweed); however, if PFS conducts appropriate maintenance of the culverts along the rail line this impact could be minimized. If such maintenance included periodic inspection and clearing of any obstructions within the culverts, these culverts would function as designed and stream flow alternation would be minimized.

New ITF near Timpie. The recent high water level for the Great Salt Lake was approximately 1284 m (4211.15 ft) in 1986. Planning documents issued by the State of Utah Department of Natural Resources in January 1999 designate the floodplain elevation of the Lake as 1284 m (4212 ft) for planning purposes and 1285.7 m (4217 ft) as the extent of the Lake's historic floodplain (in about 1670 to 1700 A.D.). The ITF would be constructed at an elevation of 1288.1 m (4225 ft)—well above the designated floodplain of the Great Salt Lake. Therefore, flooding is not expected at the ITF site during operations.

5.2.2.3 Water Use

Water use impacts during operation of the transportation facilities would be small. Water use during operation of the rail line would be limited to drinking water for personnel. Bottled water from the proposed PFSF would be provided to the workers. The incremental consumption of water by rail crew members would not have an adverse impact on water availability.

During operation of the ITF, water would be used for drinking and restroom facilities. Water needed during operation of the ITF would be obtained from a local commercial water supplier. Considering the small number of workers (approximately 9–11 people), acquisition of water from a commercial source would not have an adverse impact on water availability.

5.2.2.4 Groundwater

Any impacts to groundwater that would occur during operation of either the rail line or the ITF would be small because no groundwater is proposed for use. Accidental spillage of fuel could contaminate soil at some location along the rail corridor. However, this is unlikely because refueling activities would be limited to the rail siding. PFS's Best Management Practices Plan could prescribe methods for properly responding to fuel leaks or spills to prevent any impact to groundwater from such an event. To ensure that construction and operational activities will not lead to contamination of groundwater, the Cooperating Agencies propose that PFS be required to implement a BMP including a spill response procedure, and be required to be responsible for clean up of spills or accidents at the rail siding and along the rail line in conformance with applicable standards (see Section 9.4.2).

During operation of the ITF there is little potential for such fuel spills to impact groundwater quality because the primary activity would be the transfer of SNF casks from railcars to heavy-haul vehicles. The nature of the proposed ITF activities is not likely to cause accidental spills. Nevertheless, to minimize the potential for adverse impacts to groundwater from construction and operational activities, the Cooperating Agencies propose that PFS be required to implement a BMP including a spill

response procedure, and be required to be responsible for clean up of spills or accidents at the ITF, should that option be chosen, in conformance with applicable standards.

5.2.3 Impacts at the Alternative Site (Site B)

Construction and operation of either the rail line or ITF with the proposed PFSF at Site B would produce impacts to surface water and groundwater that would be similar to those of a facility located at Site A. These impacts are described above.

5.2.4 Mitigation Measures

Impacts to water quality could occur if a significant accidental vehicular fuel spill occurred during the wet season or if spills occurred but were not cleaned up. A Best Management Practices Plan for the rail line (or ITF, should that option be chosen) could prescribe methods for minimizing or eliminating adverse impacts on groundwater from spills. Accordingly, the Cooperating Agencies propose that PFS be required to develop a Best Management Practices Plan, including a spill response procedure, for the proposed rail line or ITF, and be required to be responsible for clean up of spills or accidents at the rail siding, along the right-of-way for the rail line, and at the ITF (see Section 9.4.2).

To minimize the significance of any changes to the natural drainage channels, the Cooperating Agencies propose that PFS design culverts along the corridor to carry the precipitation from a 100-year flood event. A maintenance plan to periodically check the rail line culverts for windblown debris and to clean them as necessary would keep them free of such material, and would ensure the rail line culverts would function as designed, thus minimizing stream flow alterations. Accordingly, the Cooperating Agencies propose that PFS be required to develop a maintenance plan to check the rail line culverts for debris and clean them as necessary (see Section 9.4.2).

5.3 Air Quality

5.3.1 Construction Impacts

As discussed below, the temporary and localized effects of construction could produce occasional and localized moderate impacts on air quality in the immediate vicinity of the construction activity, and small impacts elsewhere. Air quality impacts of operations would be small.

During construction of either the proposed Skunk Ridge rail corridor or the ITF near Timpie, temporary and localized increases in atmospheric concentrations of nitrogen dioxide (NO₂), carbon monoxide (CO), sulfur dioxide (SO₂), volatile organic compounds (VOCs), and particulate matter would result from exhaust emissions of workers' vehicles, heavy construction vehicles, diesel generators, and other machinery and tools. Particulate matter in the form of fugitive dust emitted from excavation and earthwork would lead to local increases in atmospheric concentrations of PM-10 where construction occurs near Interstate 80. As would be the case for construction of the proposed PFSF (see Section 4.3.1), fugitive dust would be the primary source of impact to air quality during construction of either the proposed Skunk Ridge rail corridor or the ITF near Timpie.

As discussed below, construction of new rail sidings at either Skunk Ridge or Timpie could produce temporary airborne concentrations that exceed the 24-hour PM-10 standard along segments of

Interstate 80 that pass near the construction area(s). Such airborne concentrations often occur near road construction areas that involve appreciable excavation/earthwork. Airborne dust in road construction areas can sometimes affect visibility. While such dust is usually not sufficient to create a safety hazard, it can cause annoyance and inconvenience. These types of impacts are discussed below, along with their applicable mitigation measures.

5.3.1.1 New Rail Line from Skunk Ridge

A new rail siding (see Figure 2.4) would be constructed near Skunk Ridge to connect a proposed new rail line with the existing Union Pacific main line. The preferred route for the new rail line would begin near Skunk Ridge and proceed eastward, roughly paralleling Interstate 80, for about 5 km (3 miles) before proceeding southward to a location due west of the proposed PFSF site (see Figure 1.2). From there it would proceed eastward to an area just south of the proposed storage pads (see Figure 2.2). The area of greatest potential PM-10 impact is considered to be along the northern end of the proposed rail line where it would run parallel to Interstate 80. Impacts at that location would be analogous to those from typical construction of a highway interchange, where members of the general public could be exposed to high PM-10 concentrations for brief periods as their vehicles pass through the construction area.

To obtain an upper bound estimate of PM-10 impact from construction of the new rail line, a total area of 5 ha (12.4 acres), 1 km (0.6 miles) long and 50 m (164 ft) wide, was assumed to be simultaneously undergoing heavy construction. This construction area was assumed to run west-east (approximately parallel to the highway), with its nearest boundary 50 m (164 ft) south of the highway. Assumptions regarding emissions per unit area and work schedule were the same as those for the analysis of the proposed PFSF construction discussed in Section 4.3.1, and the same 8 years of meteorological data from SLCIA were used. The same model used for modeling effects of site construction [i.e., ISCST (EPA 1995)] was applied to obtain the air-quality impacts.

To avoid exceeding the NAAQS for PM-10, 24-hour average concentrations could not exceed $150 \mu\text{g}/\text{m}^3$ and annual average concentrations could not exceed $50 \mu\text{g}/\text{m}^3$. The existing background values for 24-hour and annual average PM-10 concentration (from Table 3.3) are $87 \mu\text{g}/\text{m}^3$ and $22 \mu\text{g}/\text{m}^3$, respectively. Therefore, to avoid an exceedance of the NAAQS, the maximum construction-related PM-10 concentrations would be $63 \mu\text{g}/\text{m}^3$ for a 24-hour average and $28 \mu\text{g}/\text{m}^3$ for an annual average.

The maximum modeled 24-hour average construction-related PM-10 concentration along Interstate 80 was $290 \mu\text{g}/\text{m}^3$; mitigation would have to reduce fugitive dust to about 20 percent of its uncontrolled value (i.e., 20 percent of 289, or $58 \mu\text{g}/\text{m}^3$) to avoid an exceedance of the NAAQS. Modeled construction-related fugitive dust exceeded $200 \mu\text{g}/\text{m}^3$ on only 6 days during the 8-year modeling period; therefore, in the vast majority of cases, mitigating fugitive dust to about 30 percent of its uncontrolled value (i.e., 30 percent of 200, or $60 \mu\text{g}/\text{m}^3$) would be sufficient to avoid an exceedance of the 24-hour NAAQS for PM-10. The maximum annual average concentration expected from construction 5 days per week was less than $32 \mu\text{g}/\text{m}^3$. A reduction of only about 12 percent would keep construction-related PM-10 concentrations at levels at or below $28 \mu\text{g}/\text{m}^3$ and cumulative concentrations below the NAAQS. This level of reduction is expected to occur as a result of mitigating fugitive dust emissions to the level required to avoid exceeding the 24-hour NAAQS.

If normal dust suppression measures are implemented, impacts of constructing a rail line and siding south of Interstate 80 are expected to be equal to or less than effects of typical road construction in

the area. Temporary and localized moderate impacts would be expected in the immediate vicinity of the construction area, and small impacts would be expected elsewhere. These effects can be mitigated to acceptable levels by dust control measures, such as surface wetting, and by restricting the area under construction at any one time to less than 5 ha (12.5 acres).

5.3.1.2 New ITF Near Timpie

For the proposed ITF (see Figure 2.14), the largest area that would be under construction at any one time is projected to be about 4.5 ha (11 acres). The ISCST air dispersion model (EPA 1995) and assumptions similar to those used in the analysis of construction of the proposed PFSF and the proposed rail line were applied to the analysis of air quality impacts from this construction. As in those analyses, construction impacts and effects of local sources were added to background values of PM-10 concentrations to obtain cumulative impacts. On some days during construction, particulate concentration could exceed the 24-hour PM-10 standard along as much as 650 m (about 0.4 mile) of Interstate 80 if no dust suppression measures were used. If the 24-hour PM-10 standard were briefly exceeded, the location of the stretch of highway affected would depend on wind direction. Watering to reduce fugitive dust by 50 percent would be expected to prevent exceedances of the 24-hour NAAQS for PM-10 along Interstate 80. No airborne concentrations exceeding the annual NAAQS would be expected along Interstate 80, even if no mitigation (e.g., sprinkling with water) were applied. These temporary and localized effects of construction are expected to produce occasional and localized moderate impacts on air quality in the immediate vicinity of the construction activity, and small impacts elsewhere. These effects would be mitigated by dust control measures, such as surface wetting.

5.3.2 Impacts During Operations

5.3.2.1 New Rail Line from Skunk Ridge

As discussed in Section 4.3, the air quality impacts expected from operation of a rail line and a switchyard locomotive at the storage site are expected to be small. Locomotives using the rail line would emit pollutants in only one area for a very short period before moving on. Operation of a switchyard locomotive would be sporadic, occurring for an hour or two on any particular day, and pollutant emissions would be dispersed over the area traversed by the locomotive.

5.3.2.2 New ITF Near Timpie

Air quality impacts expected from operation of transport vehicles are typical of those from combustion engines used to power locomotives and construction equipment, diesel generators, etc. Some emissions of NO₂, SO₂, PM-10, and CO would occur; however, their effects on long-term air quality would be small because of the infrequent occurrence of cask transfer from railcars to heavy haul trucks. Short-term effects would involve emissions that would not add appreciably to those from vehicles routinely using Interstate-80. Impacts from the operation of the ITF near Timpie are, therefore, expected to be small.

5.3.3 Impacts at the Alternative Site B

5.3.3.1 Construction Impacts

Site B would be slightly farther than Site A from Interstate 80 and from the nearest existing rail line. This would increase the length of a rail line to the proposed facility by about 2 percent, and would increase the construction activity by a proportionate amount. In addition, the length of travel for construction materials and personnel would also increase during the additional construction. However, this would not be expected to increase the traffic density. The additional distance would not increase the significance of the associated air-quality impacts, which would be small in either case.

5.3.3.2 Impacts During Operations

Site B would be slightly farther than Site A from Interstate 80 and from the nearest existing rail line. This would increase emissions from transportation by an additional 1.6 km (1 mile) or around 2 percent of the distance to the proposed PFSF. Ambient-air concentrations of pollutants along the road or rail line would not be noticeably different; but those routes and associated emission points would extend about 1 km (3,300 ft) farther. This extension would not change the significance level of the air quality impacts, which would be small in either case.

5.3.4 Mitigation Measures

The mitigation measures described in Section 4.3.4 for construction and operation of the proposed PFSF would also be applicable to the proposed transportation facilities in Skull Valley. However, because of the proximity of transportation facility construction to Interstate-80 and the large number of individuals on Interstate-80 who could be exposed to fugitive dust from the construction site, additional mitigation measures are warranted. These measures are described below.

5.3.4.1 Construction Impacts

Air quality impacts from construction of the proposed rail line or ITF would mainly involve fugitive dust resulting from earthmoving activities. Routine sprinkling of disturbed surfaces with water when winds are blowing toward Interstate 80 would reduce human exposure to airborne particulate matter. The application of surfactants or surface crusting agents would also be effective in reducing dust emissions from construction areas. Minimizing the size (i.e., acreage) of active construction areas and/or installing barriers to shield active construction areas from the wind are two additional measures that would reduce the total amounts of dust emitted from the construction site. The Cooperating Agencies propose that PFS be required to develop a program to control fugitive dust during construction that includes methods such as one or more of those described above (see Section 9.4.2).

5.3.4.2 Impacts During Operations

Impacts of operations at the proposed PFSF site, an ITF, and a rail line are similar; all involve small emissions of air pollutants from fossil-fuel combustion. Impacts would be small and could not be reduced appreciably by additional mitigation measures, such as enhanced vehicle emission controls or extensive power engine maintenance campaigns.

5.4 Ecological Resources

The potential impacts on ecological resources of site preparation, construction, and operation of facilities for transporting SNF to the PSF site are evaluated and discussed in this section. Areas of potential concern include construction and operation activities that would disturb or remove vegetation, animals, and wetlands either temporarily or permanently. Direct losses from land disturbance are quantified by determining the amounts of habitat lost as a result of construction activities. Potential impacts on species of special concern, as identified in Section 3.4.3, that are found to reside on or use the areas necessary for the transportation facilities are also evaluated.

Construction and operation of the proposed transportation facilities may impact wildlife including mammals, birds, and nesting raptors. With the implementation of appropriate mitigation measures, impacts as a result of the Skunk Ridge rail line are expected to be small for all these species. If the heavy haul truck transportation alternative were chosen, much less habitat for these species would be disturbed, and, therefore, it would also result in small impacts.

5.4.1 Construction Impacts

5.4.1.1 Vegetation

Direct impacts from construction would include clearing existing vegetation and modifying wildlife habitat. Some of the area to be cleared would be covered by the rail line and rail siding at Skunk Ridge; part of the cleared area would be revegetated. None of the area to be cleared at the ITF near Timpie would be revegetated. In addition, fugitive dust from construction could have indirect effects on vegetation. Construction of the rail corridor or ITF near Timpie is expected to have only a small impact on vegetation and could have a beneficial impact (due to the use of native species) along the Skunk Ridge rail line corridor when revegetation occurs following construction.

Table 2.4 presents the amount of land that would be cleared for each of the transportation alternatives. Construction of the Skunk Ridge rail line corridor, the preferred transportation alternative, would require clearing vegetation and grading soil from a total of 314 ha (776 acres) to reach the preferred site (Site A). For this option approximately 63 ha (155 acres) of desert shrub/grass vegetation would remain cleared for the life of the facility; the remaining cleared area (251 ha [621 acres]) would be replanted following construction primarily with native vegetation. For the heavy-haul truck option the area to be cleared would be 4.5 ha (11 acres) for the ITF near Timpie, none of which would be revegetated. The area to be used for the ITF is the location of the existing Union Pacific rail line, and, as such, it is previously disturbed; hence, any construction activities in that area would have only a small impact on native vegetation.

There are no unique habitats that would be cleared for either the ITF near Timpie or the Skunk Ridge rail corridor. Much of the vegetation that would be cleared includes non-native species such as cheatgrass. Most of the land that would be cleared for the Skunk Ridge rail line corridor would be replanted with native vegetation following construction. The revegetation plan would be similar to that discussed in Section 4.4.1. A detailed revegetation plan would be developed in consultation with BLM during construction (PFS/RAI2 1999). A seed mixture that could be used for revegetation is listed in Table 5.2. All of the species in this table, except prostrate *Kochia*, are native species, and all except Lewis flax have a high fire tolerance (USDA NRCS 1999). The revegetation plan would comply with

the latest BLM guidelines on revegetation in effect at that time for details such as soil preparation, type of seed mix, fertilizing, time of year to plant, and watering frequency (see Section 5.4.4.1).

Table 5.2. Potential seed mixture for rehabilitation of the area cleared for the rail line

Scientific name	Common name	Planting rate kg/ha (lb/acre)
<i>Elymus smithii</i>	Western wheatgrass	3.6 (3)
<i>Stipa hymenoides</i>	Indian rice grass	2.4 (2)
<i>Linum lewisii</i>	Lewis (or blue) flax	1.2 (1)
<i>Atriplex canescens</i>	Four winged saltbush	0.6 (0.5)
<i>Kochia prostrata</i>	Prostrate Kochia (prostrate summer cypress)	0.6 (0.5)

Fugitive dust would be generated during construction, as discussed in Section 5.3. The small, short-term, incremental amount of dust that would be generated from construction activities is expected to only have a small impact on vegetation since vegetation growing in such environments is not sensitive to dust.

5.4.1.2 Wildlife

During the construction of the proposed transportation facilities, wildlife, such as ground squirrels, kangaroo mice, and small reptiles could be displaced or lost due to the excavation of soils. There would be a loss of nest sites for certain species of birds and burrow sites for species such as gophers and burrowing owl. This reduction of animals and wildlife habitat would have a slightly negative impact on the abundance of prey for predatory species, such as hawks, eagles, owls, and fox species. However, the permanently disturbed area is expected to have only a small negative impact on available wildlife habitat. Even when considering the longer rail line route to Site B, less than 0.3 percent of Skull Valley would be disturbed due to the construction of the railroad corridor. If the heavy haul truck alternative were chosen, the amount of habitat disturbance would be reduced to less than 0.01 percent of Skull Valley, as only the ITF area would require clearing [approximately 4.5 ha (11 acres)].

Because wildlife in Skull Valley do not exclusively use any particular portion of the valley, the presence of the new rail line would not significantly contribute to habitat fragmentation, segregation, or interruption of habitat connectivity. Also, because there are no clearly defined migration or seasonal use patterns for the wildlife in Skull Valley, the new rail line would not significantly affect the movement of wildlife in the valley. The physical presence of the railroad may help to keep the feral horses up on the mountain within the herd area, so there may be a slight beneficial impact to horses from the proposed project.

The truck transportation option for Skull Valley would include an ITF near Timpie. There are no unique habitats that would be cleared for the ITF near Timpie; therefore, impacts to wildlife are expected to be small. Because no road widenings are proposed for the Skull Valley Road alternative, impacts to listed species dependent on springs and wetlands to the north of the facility are not expected. These

species would include mink, ringtail, speckled dace, Great Basin spadefoot, bobolink, common yellowthroat, snowy plover, Caspian tern, American white pelican, herons, white-faced ibis, and long-billed curlew.

5.4.1.3 Wetlands

No wetlands would be disturbed by construction of the Skunk Ridge transportation corridor or the ITF near Timpie (see Section 3.4.2.2) as none exist in either place. The largest wetland area in Skull Valley, Horseshoe Springs, is approximately 11 km (7 miles) from the rail corridor, nearly 16 km (10 miles) from the ITF near Timpie location, and approximately 335 m (1,100 ft) from Skull Valley Road (see Figure 3.8). Several smaller springs are located near Skull Valley Road. The impact of construction on wetlands for transportation facilities would be small since there are none on or near any of the proposed construction areas.

5.4.1.4 Perennial and Ephemeral Streams

The construction of the rail line or the ITF near Timpie would have a small impact on streams. Runoff from the ITF near Timpie would not enter any streams and, thus, would have a small impact on them.

The proposed Skunk Ridge rail corridor would cross 32 ephemeral or intermittent drainages (see Section 2.1.1.3). Depending upon the time of year that rail construction occurs, disturbed soils entrained by these ephemeral desert washes could create minor short-term increases in the turbidity of any water in such streams. These impacts on streams would be small. A CWA Section 404 permit from the Corps of Engineers would be needed prior to construction of those sections of the Skunk Ridge rail corridor that would use culverts to cross these areas. Necessary permits are further discussed in Section 1.6 of this FEIS.

The proposed Skunk Ridge rail line would cross many ephemeral streams. These are seasonally wet and important to many wildlife species, providing water to roaming mammals, such as pronghorn antelope and mule deer. It is important to protect any streams that may occur along the corridor. The new rail line would be designed such that natural drainages would be preserved; hence, any impacts to wildlife associated with a reduction in seasonally wet areas would be expected to be small.

5.4.1.5 Threatened and Endangered Species and Other Species of Special Concern

There are no plant species of special concern that occur in the area of the Skunk Ridge rail line or the ITF near Timpie. Thus, construction of these facilities would have no effect on special concern plant species.

As discussed in Section 3.4.3.2, peregrine falcon populations have recently increased and continue to increase in Utah and in the United States. The species is now considered recovered nationally and has been removed from the Federal list of threatened and endangered species. The species is, however, still listed by the state of Utah as endangered. Peregrine falcons nesting in this area could use the ITF site for foraging. The construction of the ITF would have a small impact to peregrine falcons because only a small amount of land would be altered at the ITF and it is unlikely that the falcons' foraging base (other birds and occasionally small mammals) would be significantly impacted.

Construction of the ITF should not disturb the falcons at the Timpie Springs nesting tower even during breeding season. Falcons have successfully bred at that location nine of the last 13 years, even with

the nearby Cargill salt processing plant and train and highway traffic. Thus, the birds are acclimated to disturbances from plant activities and traffic. The ITF would be much further away than the salt processing plant so that impacts due to disturbances would be greater from the salt plant than from the ITF. Only if the ITF were within one mile of the nest site would the state recommend curtailing activity during the breeding season (UDWR 1997a). Therefore, the impacts of disturbances from construction on the breeding success of the falcons at the Timpie Springs nesting tower would be small.

Increased traffic from construction of the ITF at Timpie, even in combination with water level changes in the Great Salt Lake, would have a small impact on peregrine falcons. As discussed in Section 5.5.1.2, impacts of the construction of a ITF near Timpie on the local transportation system are expected to be small. A maximum of approximately 100 additional vehicle trips per day would occur on Interstate 80 (about 27 truck trips per day for three months of the 12-month construction period and about 70 vehicles for the construction force during the entire 12-month construction period). This increase amounts to an approximately 1.2 percent greater volume of traffic on the interstate than the 1995 level. There would be no increase in train traffic during construction.

It is possible that the water level in the Great Salt Lake could change during the year when the ITF is being constructed. Since 1845, the water level in the Great Salt Lake has varied from just over 4,190 to 4,212 feet above sea level (USGS 2001). The highest level, 4,212 feet, has occurred as recently as 1985. Such elevation changes could result in wetlands becoming established in different places around the lake, thus, creating new habitat for some peregrine prey species and, consequently, new foraging areas for the peregrines. Changes in the water level of the Great Salt Lake and habitats around it will occur whether or not the ITF is built. Collisions of falcons with traffic have historically been very rare. If new wetlands become established close to I-80 due to a change in the elevation of the Great Salt Lake, and if those wetlands are used by the falcons for foraging, there could potentially be an increase in the number of collisions between peregrines and vehicles. However, since the elevation of the Great Salt Lake has changed regularly over time and since falcon collisions have historically been uncommon, collision of falcons with traffic would be expected to still be uncommon even when the lake level again changes. As noted above, construction of the ITF would increase total traffic along I-80 by only 1.2 % over 1995 levels, a small increase that should not result in many additional collisions of falcons with traffic even if they are foraging closer to the road. Furthermore, since the falcon population continues to increase, even a few collisions would not result in a significant drop in population levels. Therefore, the impact on falcons of traffic from constructing the ITF even in conjunction with a change in water level of the Great Salt Lake would be small.

As documented in Section 3.4.3.2, raptors (i.e., hawks, falcons, owls, and eagles) feed and nest throughout the area of the proposed rail corridor (Stone & Webster 1998; UDWR 1997a; PFS/ER 2001). Some of these birds are State or Federally listed (e.g., ferruginous hawk, short-eared burrowing owl). Another listed predatory bird, the loggerhead shrike, is also found in Skull Valley. Construction of the rail line could disturb or destroy nesting habitat important to these species. However, with appropriate mitigation measures, impacts to these species are predicted to be small.

Even though hawks nest in trees along Skull Valley Road (Stone & Webster 1998; UDWR 1997a; PFS/ER 2001), the heavy-haul truck alternative is expected to only have small impacts to these birds because no road widening improvements that could impact nest trees are planned for Skull Valley Road.

Habitat for mammals, including the kit fox (a BLM-listed sensitive species) would be affected due to construction of the Skunk Ridge rail line. The kit fox may be displaced or forced to change movement patterns. Since the amount of affected habitat is a very low percentage of the available habitat in Skull Valley, impacts to the kit fox are predicted to be small.

Skull Valley pocket gophers may also be displaced or destroyed as a result of the construction of the Skunk Ridge rail line. However, since the gophers are widespread in Skull Valley, the population would not be significantly affected even if the individuals in impacted burrows were to be lost (Pritchett 2001). With the implementation of surveys prior to construction, anticipated impacts to these gophers would be small.

5.4.2 Impacts During Operations

5.4.2.1 Vegetation

There would be no direct impacts on vegetation during operation of the Skunk Ridge rail corridor or ITF. Other potential impacts for the rail line corridor include additional wildfires from equipment sparking (PFS/RAI2 1999) as has been reported to occur elsewhere in the west (AmeriScan 1999) (see Section 5.8.4).

Since revegetation of the rail corridor after construction would be required to follow BLM's fire management plan for Skull Valley (see Section 3.4.1.1), it would be possible for the rail corridor to function as a green strip to help prevent the spread of both wildfires and those caused by operation of the rail line. Planting a mixture of primarily native species along the corridor as listed in Table 5.2 would have a beneficial impact on the local ecosystem and biodiversity. Thus, the planting of species that both retard fires and also rehabilitate areas where invasive annuals are growing could benefit vegetation by increasing biodiversity and improving local ecosystems.

During operation of the rail line PFS would need to control noxious weeds and other non-native species within the rail corridor. PFS would use herbicides to control noxious weeds. EPA's labeling requirements control when and under what conditions herbicides can be applied, mixed, stored, or used (e.g., wind speed, relative humidity, air temperature, chemical persistence, time since last rainfall). By following these requirements, PFS would ensure that the impacts on non-target vegetation from the use of herbicides during the operational lifetime of the rail line would be small.

5.4.2.2 Wildlife

Operation of an ITF near Timpie would have small impacts on wildlife that occur near it or that use the Great Salt Lake.

Birds may be attracted to the ITF for perching and potential nesting because of limited perching and nesting sites in the area. However, because of the disturbed nature of the area, prey species should be limited in number, making the ITF less attractive to birds. The potential for transportation accidents severe enough to damage a cask and release radioactive material is discussed in Section 5.7.2 of the FEIS. Because of the consistently conservative assumptions used to analyze those potential impacts, annual and cumulative radiological impacts of transporting SNF to the proposed PFSF are expected to be small. Therefore, no contamination of the Great Salt Lake would be expected to occur, and there would be no impacts on its wildlife either directly or via groundwater contamination.

The Skunk Ridge rail option would bisect areas between the western edge of Skull Valley and the Cedar Mountains. There are no wintering or fawning areas for pronghorn antelope or mule deer along this route; however, both species use these areas. Truck or rail traffic could cause roaming wildlife to sometimes adjust their movements and migration patterns. However, these impacts are expected to be small. Based on the proposed location of the right of way and the projected speed of the trains, there should be no direct negative impacts to wild, free-roaming horses from the proposed project. The physical presence of the railroad may help to keep the horses up on the mountain within the herd area, resulting in a slight beneficial impact to them from the proposed project.

As stated above, during operation of the rail line PFS would use herbicides to control noxious weeds and other non-native species within the rail corridor. EPA's requirements control when and under what conditions herbicides can be applied, mixed, stored, or used (e.g., wind speed, relative humidity, air temperature, chemical persistence, time since last rainfall). By following these requirements, PFS would ensure that the impact of herbicides would be small on wildlife and water resources during the operational lifetime of the rail line.

Wildfires are frequent occurrences in Skull Valley. If the rail option is implemented for the PFS project, there may be an increase in the frequency of these fires (see Section 5.8.4). Certain wildlife species that are not very mobile (i.e., small mammals and certain nesting birds) could be killed as a result of the increased frequency of fires. More mobile species would be able to avoid the fires. Cheatgrass has become a dominant plant species in Skull Valley. This habitat is considered a threat to the desert populations of the golden eagle in north-central Utah, because cheatgrass invasion in combination with wildfires results in the reduction of jackrabbit populations (Bednarz 1999; USDI 1996; Keller et al. 1998). Jackrabbits are an important food source for golden eagles. If the frequency of wildfires does not increase significantly above current levels, impacts to small mammals and those species dependent on small mammal prey species would be expected to be small because their species and their habitat would not be significantly affected by operation of the rail line. As set forth in Section 5.4.2.1, revegetated areas of the rail line corridor may function as a green strip to help prevent the spread of wildfires. Accordingly, impacts to small mammal prey species and, consequently, golden eagles are expected to be small.

5.4.2.3 Wetlands

There are no wetlands that would be impacted by operation of the Skunk Ridge transportation corridor. The major wetland area in Skull Valley, Horseshoe Springs, is approximately 11 km (7 miles) from the Skunk Ridge transportation corridor. There are no wetlands along the rail corridor itself. Thus, the impact on wetlands of corridor operation would be small.

Impacts to the wetlands along Skull Valley Road that may be caused by increased road traffic and heavy haul trucks are predicted to be small. The largest wetland is at Horseshoe Springs, 335 m (1,100 feet) west of Skull Valley Road, and it would not be impacted by traffic on the road.

5.4.2.4 Perennial and Ephemeral Streams

The operation of the rail line or an ITF near Timpie would have a small impact on streams. The proposed Skunk Ridge rail corridor would cross a number of ephemeral or intermittent drainages, but operation of the rail line would have only a small impact on them because the rail line would be designed such that natural drainages would be preserved. There are no perennial or ephemeral streams near the site for the ITF.

5.4.2.5 Threatened and Endangered Species and Other Species of Special Concern

There are no plant species of special concern that occur in the area of the Skunk Ridge rail line or the ITF near Timpie. Thus, the impact on special concern plant species of operating those facilities would be small. Listed wildlife species, from time to time, would need to adjust their movement patterns due to either the rail line or heavy-haul transport. This impact is considered to be small.

Operation of the ITF at Timpie should not disturb the falcons at the Timpie Springs nesting tower even during the breeding season. Falcons have successfully bred at that location nine of the last 13 years, even with the existing disturbances from the nearby salt processing plant and the nearby train and highway traffic. The ITF would be much farther away than the salt processing plant so that impacts due to disturbances would be greater from the salt plant than from the ITF. Only if the ITF were within one mile of the nest site would the state recommend curtailing activity during the breeding season (UDWR 1997a). Therefore, the impacts of disturbances from operation of the ITF on the breeding success of the falcons at the Timpie Springs nesting tower would be small.

During ITF operation, there would be less traffic on Interstate 80 from the project than during construction of the facility (see Section 4.5.2.6). Slow moving, heavy haul trucks would move casks down Skull Valley Road from the ITF to the main facility. Train traffic could increase by up to two trains per week (see Section 2.2.4.2). The peregrines have adjusted to existing train and highway traffic, so that this small increase in traffic should not result in additional collisions with traffic. Even if there were water level changes in the Great Salt Lake, as discussed in Section 5.5.1.2, the impact on falcons of traffic from operating the ITF would be small.

5.4.3 Impacts at the Alternative Site B

Direct and indirect impacts of construction and operation of either transportation option to Site B would be essentially the same as those for the proposed site (Site A) as discussed in Sections 5.4.1 and 5.4.2.

5.4.3.1 Vegetation

The Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would require 10 ha (24 acres) more land to be cleared than the route to Site A for a total of 324 ha (800 acres). While the impacts along this transportation corridor would be similar to those described in Section 5.4.1 for the route to Site A, the spatial extent of such impacts would be somewhat greater but still small.

5.4.3.2 Wildlife

The potential impacts to wildlife species as a result of construction and operation of rail line or the heavy haul truck route would be similar to those of the proposed action. With the appropriate mitigation employed, all potential impacts are predicted to be small.

5.4.3.3 Wetlands

The impacts on wetlands of the Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would be similar to those for Site A (i.e., they would be small).

5.4.3.4 Perennial and Ephemeral Streams

The impacts on perennial and intermittent streams of the Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would be similar to those for Site A (i.e., they would be small).

5.4.3.5 Threatened and Endangered Species and Other Species of Special Concern

The impacts on plant and wildlife species of special concern of the Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would be similar to those for Site A (i.e., they would be small).

5.4.4 Mitigation Measures

5.4.4.1 Vegetation

PFS has proposed the use of BMPs described in Table 2.7 for construction of the rail line or ITF near Timpie, and the Cooperating Agencies recommend that these BMPs be implemented. While the BMPs in Table 2.7 include temporary seeding during construction, a mixture of plant species such as those listed in Table 5.2 could be planted along the rail corridor to revegetate the rail corridor following construction. All of the species listed in Table 5.2, except prostrate Kochia (*Kochia prostrata*), are native species, and all except Lewis flax (*Linum lewisii*) have a high fire tolerance (USDA NRCS 1999). Planting a mixture of primarily native species, as listed in Table 5.2, along the rail corridor would have a beneficial impact on the local ecosystem and biodiversity. In addition, guidelines currently used by BLM, such as the Interagency Forage and Conservation Planting Guide for Utah, EC 438, or other current guidelines, could be applied in developing a plan for restoring and revegetating areas affected by construction of the rail transportation facilities. In view of the above, the Cooperating Agencies propose that PFS be required to consult with BLM before initiating construction, to develop a plan for restoring and revegetating areas affected by construction of the rail transportation facilities, including greenstrip seed mix specifications (see Section 9.4.2). Additionally, the Cooperating Agencies recommend that PFS consult qualified personnel who are familiar with the local area, including staff at the Forest Service's regional facilities and area universities who could help identify native species to use. (See Section 4.4.5 for a discussion of the use of native species in revegetation.)

PFS would need to control or eradicate noxious weeds within the rail line right-of-way. Noxious weeds could be controlled by using herbicides, biological controls, or mechanical clearing. In general, the use of herbicides should be restricted to as small an area as necessary. Herbicides must also be applied at the proper stage of plant growth to be effective (Whitson 1998). Herbicides must be used in compliance with all applicable laws, including EPA's labeling instructions (40 CFR 156) for prescribed environmental conditions (e.g., wind speed, relative humidity, air temperature, chemical persistence, time since last rainfall). The Cooperating Agencies propose that PFS be required to consult with BLM prior to construction in order to develop an adequate plan for monitoring and controlling noxious weeds during the operational lifetime of the proposed rail line (see Section 9.4.2). The Cooperating Agencies recommend that this consultation with BLM be coordinated with BIA regarding the use of herbicides during operation of the proposed PFSF. The Cooperating Agencies also propose that PFS be required to include in the plan an approved list of herbicides and consideration of non-chemical (e.g., biological) means of controlling noxious weeds (BLM 1991). The Cooperating Agencies also recommend that the list incorporate BLM's most recent standard stipulations for chemical treatment (i.e., spraying) of vegetation (e.g., see Appendix 5 in BLM 1983).

5.4.4.2 Wildlife

The Cooperating Agencies propose that PFS be required to survey the area within 30 m (100 ft) of construction of the proposed rail line or ITF site, prior to construction, for Skull Valley pocket gopher burrows and kit fox dens to minimize potential for loss of wildlife during construction (see Section 9.4.2). The Cooperating Agencies propose that PFS be required to consult with BLM regarding the appropriate timing of the surveys (see Section 9.4.2). In addition, in order for BLM to determine the significance of the location of any gopher burrow or kit fox den identified by such a survey, the Cooperating Agencies propose that PFS be required to notify BLM immediately if the surveys identify the presence of these species (see Section 9.4.2). BLM would determine the significance of the location (e.g., is it within the middle of a gopher town, or an isolated burrow on the edge of a gopher town). Specific mitigation measures would depend on the locations identified and BLM's determination, and could range from relocation of the rail line (e.g., if it is within the middle of a gopher town) to allowing construction to continue (e.g., if the rail line only intersects the outside boundaries of a gopher town).

To help minimize impacts to the movements of pronghorn antelope, mule deer, and other wildlife species, the Cooperating Agencies recommend that provisions be made in the railroad design to allow for a number of wildlife crossings, over or under the rail line. The final design for such crossings should be developed in consultation with BLM as part of the right-of-way approval process.

Activities associated with rail line construction could affect nesting success or raising young birds. Therefore, the Cooperating Agencies propose that PFS be required to survey the area within 0.8 km (0.5 mile) of the new rail transportation corridor prior to construction for raptor nests (including hawks, owls, eagles, and the loggerhead shrike) (see Section 9.4.2). If active nests are present in these areas, construction activities should be curtailed or restricted during the period from April 1 to August 15 (Stone & Webster 1998; UDWR 1997) to avoid any impacts on nesting success and rearing young. If active great horned owl or golden eagle nests are present in these areas, construction activities should be similarly curtailed or restricted during the period from February through August (UDWR 1997). In order for BLM to provide appropriate guidance on the above matters, the Cooperating Agencies propose that PFS be required to consult with BLM regarding the appropriate timing of the surveys and to notify BLM immediately if the surveys identify the presence of these species (see Section 9.4.2).

In addition, in order to avoid impacts to Federally-listed or endangered species or State of Utah or BLM-sensitive species during construction, the Cooperating Agencies propose that PFS be required to notify BLM and cease construction activities immediately if PFS identifies any such species during construction of the transportation facilities related to the proposed PFSF.

5.5 Socioeconomic and Community Resources

The potential socioeconomic impacts and impacts to community resources of two local transportation options have been assessed: (a) constructing and using a proposed new rail line from Skunk Ridge to the proposed PFSF and (b) constructing a new ITF near Timpie and using heavy-haul vehicles on the existing Skull Valley Road. Both the direct and indirect impacts to socioeconomic and community resources during construction and use of these local transportation options to the proposed PFSF are primarily associated with workers who might move into the area; use of heavy-haul vehicles on Skull Valley Road or the use of the rail corridor also result in impacts. Impacts to the socioeconomic and

community resources of the Skull Valley Band and their Reservation are indistinguishable from those to the remainder of Tooele County with the exceptions of population, land use, and economic structure. Impacts specific to the Skull Valley Band, as compared to the remainder of Tooele County, are noted in the following discussion, as appropriate.

These impacts are summarized in Table 5.3, and as discussed in the following paragraphs, would be small.

Table 5.3. Potential impacts to socioeconomic and community resources during the construction and use of new transportation facilities in Skull Valley

Category of potential impact	Significance level of potential impact	
	New rail siding and corridor	New ITF near Timpie
Population	Small	Small
Housing	Small	Small
Educational system	Small	Small
Utilities	Small	Small
Solid waste	Small	Small
Transportation and traffic	Small	Small
Land use	Moderate	Small
Economic structure	Small (but beneficial)	Small (but beneficial)

The overall approach to the assessment of impacts to socioeconomic and community resources is described in Section 4.5. It involves the development of an estimate of the number of construction workers that might move into the area. Both direct construction jobs and indirect jobs are considered. These numbers are used to determine the potential increase in the existing population, the demand on local housing, and the number of new children that might be enrolled into the existing school system. These increased numbers of people in the local area serve as the basis for determining impacts to socioeconomic and community resources during all phases of construction. The analytical approach and method (of determining the potential number of in-moving workers) are described for the new rail line and the alternative ITF in Sections 5.5.1 and 5.5.2, respectively.

5.5.1 Construction Impacts

5.5.1.1 New Rail Line from Skunk Ridge

During the 14-month construction period for the rail line and its associated siding, an estimated peak work force of 125 workers would be required for various tasks. The bulk of the manpower would be for earthwork. This portion of the work is estimated to take approximately 109 workers including equipment operators, laborers, electricians, iron workers, concrete finishers, and construction

supervision staff. The remainder of the work involves preparing the route for the rail line and laying the track; approximately 16 workers would be required to support the track-laying machine. The number of workers required to operate the proposed rail line is incorporated into the work force for operation of the proposed PFSF itself (see Section 4.5.2).

Following the same approach and using the same assumptions in the assessment of socioeconomic impacts of constructing the proposed PFSF (see Section 4.5.1), if 30 percent of the direct workforce (approximately 38 workers) moves into the area, and approximately 60 percent of those (23 workers) were accompanied by families (with a family size of 2.87), the local population would increase by 81 residents in 38 households due to direct employment. This translates into 15 workers unaccompanied by family, 23 workers accompanied by family, and 43 family members of construction workers. The construction of the rail line would also result in approximately 62 indirect jobs, with six of those workers moving into the area during the construction period. Assuming that 60 percent of these workers bring families and that the average family size would be 2.87, an upper bound of 14 new residents in six households would be expected as the result of indirect employment. Combining the above direct and indirect in-moving persons yields a total of 95 new residents in 44 households as an upper bound. Unaccompanied workers would live in 17 of these households while the other 27 households would consist of workers and their families. Based on the Tooele County average of 0.7 school aged children per household (Governor's Office of Planning and Budget, Economic and Demographic Projections, 1997; <http://www.governor.state.ut.us/dea/demographics/household.htm>), it is expected that 19 additional children would be added to local schools.

Population. Impacts of construction of the rail line to the population levels of Tooele County are expected to be small. Workers who move to the impact area during construction of the new rail line would probably be distributed in communities in the eastern portion of Tooele County (e.g., Grantsville and Tooele) because they are closest to the proposed rail line and to housing and have vacant housing units available for rent and sale. It is unlikely that any in-moving workers and their families would locate in Skull Valley itself since there are few, if any, housing units available; it is possible that members of the Skull Valley Band who return to Skull Valley for employment during construction of the proposed rail line might decide to live on the Reservation.

The precise distribution of in-movers would be determined by a number of factors, including proximity to the proposed rail line and the availability of housing and public services. The 95 new residents used as an upper bound in this analysis would represent an increase of 0.3 percent to the 1996 population of Tooele County. If all of these in-migrants located in either Grantsville or Tooele, the population increase would be 1.9 percent in Grantsville or 0.6 percent in Tooele. While growth of this magnitude could be readily accommodated without disrupting the affected communities, it is very unlikely that all new residents would settle in a single community.

Housing. Any housing impacts from construction of the rail line are expected to be small. Construction workers would need to seek housing in nearby towns because BLM will not permit camping or temporary trailers on public lands. The 44 new households used as an upper bound in this analysis would represent 12.6 percent of the vacant housing units, not counting housing units in Wendover or Dugway, that were for sale or rent in Tooele County in 1990 (the most recent year for which data are available). Even if all project-induced in-movers settled in either Grantsville or Tooele, which is highly unlikely, the number of housing units needed would not exceed the number of vacant units for sale or rent in either of these communities. Accordingly, any housing impacts are expected to be minimal.

The Skull Valley housing market is isolated by geography, and part of the valley is also isolated by its Reservation status from the rest of Tooele County. The Reservation itself is not a normal housing market. The housing market on the Reservation has the following unique characteristics. Any housing built or placed on the Reservation may be owned only by members of the Skull Valley Band. A Band member seeking to build or place housing on the Reservation must obtain approval from the Skull Valley Band General Council. Any transfer of ownership of a housing structure or a building on the Reservation must also be approved by the Council. The only persons who may reside on the Reservation itself are Band members, spouses of Band members, and their children. The values of existing houses do not include the value of underlying land, which remains in trust for the Skull Valley Band. Housing prices also reflect the strong presence of Federal housing programs. It is not clear whether there is an active housing market on the Reservation.

Impacts on Reservation housing prices would partly depend on whether the proposed PFSF would attract Band members back to the Reservation and partly on the financing mechanisms used to construct housing. If some Band members moved back to the Reservation to take jobs at the proposed PFSF, there might be some increase in demand for housing on the Reservation, but whether returning Band members would simply build new housing, with no effect on the nominal value of existing homes, is not known. In any case, due to the small number of workers expected to move back to the Reservation, the impact on housing prices is expected to be small. Similarly, it is not anticipated that the presence of the proposed facility would deter Band members from moving back to the Reservation, and thereby potentially depress housing prices. It is equally likely that members would move back to be near employment opportunities, as is the case with, for example, nuclear power plants workers. These workers are likely to be more concerned with the ease of commuting to work, rather than potential adverse environmental impacts of the proposed PFSF. In summary, given the above characteristics of the housing market on the Reservation, and the small number of workers expected to move back to the Reservation, the proposed PFSF project would likely have only a small effect on the housing market on the Reservation.

Education. The impacts to the existing education system during construction of the rail corridor are expected to be small. The addition of 19 new school-age children would increase enrollment in Tooele County by only 0.23 percent. Even in the highly unlikely event that all in-movers would locate in a single community, the increases in enrollment would be relatively small. For instance, if all new students were enrolled in elementary school in the city of Tooele, there would be an increase of approximately 1 percent, 2.6 percent if all new students were enrolled in the Tooele Junior High School, or an increase of 1.3 percent if all new students were enrolled in the Tooele High School; similarly, if all the new students were enrolled at schools in Grantsville, the increases would be 2.5 percent in the elementary school, 3.6 percent in the middle school, or 2.4 percent in the high school. It should be noted, however, that the Tooele County School District has already embarked on a significant expansion of its capacity, so that any additional increase would not place demands on the system that have not already been anticipated.

Utilities. The impacts of constructing the rail line on the provision of water and other utilities within Skull Valley, including impacts to the Skull Valley Band, are expected to be small. The addition of 45 new households and 129 new residents is not expected to strain existing utilities within the impact area, since most if not all of those in-movers would be expected to occupy currently vacant housing units in Rush Valley or Tooele Valley already hooked up to utilities.

Solid and sanitary waste. Impacts to solid waste management are expected to be small to non-existent. Clearing of the right-of-way would involve the removal and disposal of vegetation along the

12-m (40-ft) wide rail bed, at cut and fill areas, and at soil stockpile locations within the temporary use areas. Woody vegetation would be shredded and scattered in place. Sanitary wastes would be managed with conventional systems, such as portable toilets.

Transportation and traffic. Impacts to transportation by construction of the rail line are expected to be small. Construction of the rail line and siding would require the movement of large quantities of excavated soils and ballast and sub-ballast as well as workers to construction areas. It is anticipated that most materials and workers would travel to the site of the proposed rail siding by way of Interstate 80. PFS has indicated that materials and workers would travel to each point of construction by way of the rail line as construction proceeds along the proposed route. Nothing would prevent PFS from transporting materials and workers on unimproved roads (i.e., dirt) that are adjacent to the rail corridor. If PFS uses these dirt roads frequently or to transport heavy materials, the roads could degrade and become impassable because of the type of soils in the area (see Section 3.1). If it becomes necessary to use the dirt roads, PFS could develop a plan in consultation with BLM to minimize the impact. The Cooperating Agencies propose that PFS be required to notify BLM prior to any use of these unimproved roads that could lead to their degradation, and to consult with BLM to develop an adequate plan to minimize any degradation of such roads.

As noted in Section 2.1.1.3, an attempt would be made to balance the expected volume of cuts and fills to minimize the need for additional fill material. With such an effort, a surplus of approximately 196,000 m³ (256,000 yd³) of material could be generated. In addition to the movement of excavated soils, which would have minimal impact on transportation due to the intent to keep such materials near the point of generation, construction of the proposed rail line and siding would require approximately 245,000 m³ (320,000 yd³) of ballast and sub-ballast (composed of crushed gravel or rock) to be obtained from one or more existing commercial gravel pits in the area. Assuming a per-truck capacity of approximately 15.3 m³ (20 yd³) (PFS/SAR 2001) for movement of the ballast and sub-ballast, a total of approximately 32,000 truck trips would be required to transport the ballast and sub-ballast (a truck trip, or vehicle trip, is defined as a single one-directional vehicle movement; hence, a vehicle arriving and departing the point of delivery constitutes two vehicle trips). Assuming that these 32,000 trips are made evenly throughout 12 months of the 14-month construction period, there would be approximately 134 truck trips per day (67 trucks going each way on Interstate 80 to and from the point of ballast and sub-ballast delivery) or approximately 13 vehicles per hour.

In addition to ballast and sub-ballast deliveries, a peak construction work force of 125 workers would commute to and from the construction site in individual passenger vehicles and light trucks on a daily basis. These workers could account for an increase of 250 vehicle trips per day on Interstate 80 during construction of the rail line and siding. All together, construction of the rail line and siding could result in an increase of 384 vehicle trips per day on Interstate 80 (250 vehicle trips per day for the construction workers and 134 vehicle trips per day for the ballast and sub-ballast delivery). This increase amounts to approximately 4.5 percent greater use of Interstate 80 than had been experienced in 1995 (see Section 3.5.2.4). This additional traffic volume would have a negligible effect on the level of service on Interstate 80 but could have temporary adverse effects on the movement of traffic onto and off of the interstate. This adverse effect on feeders to and from Interstate 80 also results from delivery trucks moving at a slower rate of speed before entering and after leaving Interstate 80 than other traffic, requiring other traffic to reduce travel speed.

Land use. Impacts to current land use from construction of the rail line are expected to be moderate. The proposed right-of-way between Skunk Ridge and the proposed facility crosses public land administered by BLM's Salt Lake Field Office. Construction of the rail line could result in some

reduced use of this resource by members of the public (Section 5.8.3). In addition, some grazing activities on the Eightmile and Black Knoll Pastures of the Skull Valley grazing allotment might be temporarily curtailed during construction of the rail line from Skunk Ridge but should return to pre-construction levels following construction.

The proposed rail route through Skull Valley would disrupt livestock movement between bench areas and cheatgrass flats. Since water is predominantly located west and above the proposed route in most areas, grazing would be intensified along the bench areas, resulting in greater utilization and potential rangeland degradation. Wild horse use in this area is also quite significant, and the proposed rail line could have a similar effect on their use of these bench areas.

The proposed route would cross two Pasture and Allotment division fences. The fences run east-west across the valley. The route would also cross several unimproved roads which are equipped with cattle guard crossings to prevent livestock movement between pastures. PFS plans to include cattle guards along the rail route wherever the route crosses Pasture and Allotment division fences. Three livestock water pipelines also cross the rail route line; provision would be made to keep them serviceable.

Economic structure. Because the construction workforce (direct and indirect) would be only 125 people and the construction period would be 14 months, the effect of the proposed action on the economic structure of the local area would be small, but favorable. The unemployment rate in Tooele County has the potential to fall slightly in the impact area due to the hiring of current residents and the in-moving of project employees. In addition, impacts to the economic structure of the Skull Valley Band should be proportionately greater, since any construction jobs that might be filled by tribal members would constitute a positive impact on the Tribal economy, and increased sales by the Pony Express Convenience Store are likely to result. In addition to jobs for Tribal members, the applicant has indicated that training and development opportunities would be available for other Tribal members (PFS/SAR 2001). Finally, the purchase of ballast and sub-ballast from nearby commercial gravel pits would be a small but positive impact on the local economy.

5.5.1.2 New ITF Near Timpie

Construction of the ITF and its associated rail siding and access road would require an estimated peak work force of 35 workers and would be performed within one year of issuance of an NRC license for the proposed PFSF. The bulk of the manpower would be for earthwork, pouring the building foundation, erecting the gantry crane and metal building, installing building electrical and mechanical infrastructure, laying railroad track, paving the access road, and installing site fencing. The work force would include equipment operators, laborers, electricians, iron workers, concrete finishers, and construction supervision staff.

Following the same approach and using the same assumptions in the assessment of socioeconomic impacts of constructing the proposed PFSF (see Section 4.5.1), if 30 percent of the direct workforce (approximately 11 workers) moves into the area, and approximately 60 percent of those (seven workers) were accompanied by families (with a family size of 2.87), the local population would increase by 24 residents in 11 households due to direct employment; this translates into four workers unaccompanied by family, seven workers accompanied by family, and 13 family members of construction workers. The construction of the ITF would also result in approximately 18 indirect jobs, with two of those workers moving into the area during the construction period; assuming that one of these workers brings a family and that the average family size would be 2.87, an upper bound of four

new residents in two households would be expected as the result of indirect employment. Combining the above direct and indirect in-moving yields a total of 28 new residents in 13 households as an upper bound. Unaccompanied workers would live in five of these households while the other eight households would consist of workers and their families. Based on the Tooele County average of 0.7 school aged children per household (Governor's Office of Planning and Budget, Economic and Demographic Projections, 1997; <http://www.governor.state.ut.us/dea/demographics/household.htm>), it is expected that six additional children would be added to local schools.

Population. Impacts of construction of the ITF to populations levels in Tooele County are expected to be small. Workers who move to the impact area during construction of the ITF and associated siding would probably be distributed in communities in the eastern portion of Tooele County (e.g., Grantsville and Tooele) because they are closest to the proposed site for the ITF and have vacant housing units available for rent and sale. It is unlikely that any in-moving workers and their families would locate in Skull Valley itself since there are few, if any, housing units available; it is possible that members of the Skull Valley Band who return to their Reservation for employment during construction of the ITF might decide to live on the Reservation. The precise distribution of in-movers would be determined by a number of factors, including proximity to the proposed ITF and the availability of housing and public services. The 28 new residents used in this analysis as an upper bound would represent an increase of less than 0.1 percent to the 1996 population of Tooele County. If all of these in-migrants located in either Grantsville or Tooele, the population increase would be 0.6 percent in Grantsville or 0.2 percent in Tooele. While growth of this magnitude could be accommodated without disrupting the affected communities, it is very unlikely that all new residents would settle in a single community.

Housing. Any housing impacts from construction of the ITF are expected to be small. The 13 new households used as an upper bound in this analysis would represent approximately 3.8 percent of the vacant housing units, not counting housing units in Wendover or Dugway, that were for sale or rent in Tooele County in 1990 (the most recent year for which data are available). Even if all project-induced in-movers settled in either Grantsville or Tooele, which is highly unlikely, the number of housing units needed would not exceed the number of vacant units for sale or rent in either of these communities.

Education. The addition of six new school-age children would increase enrollment in Tooele County by only 0.07 percent. Even in the highly unlikely event that all in-movers would locate in a single community, the increases in enrollment would be very small.

Utilities. The impacts of constructing the ITF on water use and other utilities within Skull Valley are expected to be small. The addition of 13 new households and 28 new residents is not expected to strain existing utilities within the impact area, since most if not all of those in-movers would be expected to occupy currently vacant housing units already hooked up to utilities (e.g., in Rush Valley or Tooele Valley).

Solid and sanitary waste. Impacts to solid waste management are expected to be small to non-existent. Clearing of the right-of-way for the ITF parcel would involve the removal and disposal of vegetation within the right-of-way. Any woody vegetation would be shredded and scattered in place. Sanitary wastes would be managed with conventional systems, such as portable toilets.

Transportation and traffic. Impacts of the construction of the ITF on the local transportation system are expected to be small. Construction of the ITF and associated access road and rail siding would require the movement of excavated soils and ballast and sub-ballast. The amount of ballast, sub-ballast, and other rail bed construction materials needed for the rail siding amounts to approximately

12,350 m³ (16,150 yd³), and approximately 1,900 m³ (2,500 yd³) of asphalt paving would also be needed (PFS/ER 2001). The ballast and sub-ballast (composed of crushed gravel or rock) would be obtained from one or more existing commercial gravel pits in the area. Assuming a per-truck capacity of approximately 15.3 m³ (20 yd³) (PFS/SAR 2001) for movement of the ballast, sub-ballast, and other construction materials a total of approximately 1,615 truck trips would be required to transport all construction materials (a truck trip, or vehicle trip, is defined as a single one-directional vehicle movement; hence, a vehicle arriving and departing the point of delivery constitutes two vehicle trips). Assuming that these 1,615 trips are made within a three month period of the 12-month construction period, there would be approximately 27 truck trips per day (13 to 14 trucks going each way on I-80 to and from the point of ballast and sub-ballast delivery) or approximately three vehicles per hour.

In addition to ballast and sub-ballast deliveries, a peak construction work force of 35 workers would commute to and from the construction site in individual passenger vehicles and light trucks on a daily basis. These workers will account for an increase of 70 vehicle trips per day on Interstate 80 during construction of the ITF and associated access road and rail siding. All together, construction of the ITF and associated access road and rail siding would result in an increase of approximately 100 vehicle trips per day on Interstate 80. This increase amounts to approximately 1.2 percent greater use of the interstate than had been experienced in 1995 (see Section 3.5.2.4). This additional traffic volume would have a negligible effect on the level of service on Interstate 80 but could have some temporary adverse effects on the movement of traffic onto and off of the interstate. This adverse effect on feeders to and from Interstate 80 also results from delivery trucks moving at a slower rate of speed before entering and after leaving the interstate than other traffic, requiring other traffic to reduce travel speed. There is also the potential for increased wear and maintenance requirements on Skull Valley Road due to heavy truck traffic.

Land use. Construction of the ITF would have small impacts on current land use. The site for the ITF and associated access road and rail siding is located on previously disturbed, but currently unused public land, administered by the BLM. The site is adjacent to the Union Pacific main line.

Economic structure. Because the construction workforce (direct and indirect) would be 35 people and the construction period would be less than one year, the effect of the proposed PFSF on the economic structure of the local area would be small but favorable. The unemployment rate in Tooele County would have the potential to fall slightly in the impact area due to the hiring of current residents and the in-moving of project employees. In addition, impacts to the economic structure of the Skull Valley Band should be proportionately greater, since any construction jobs that might be filled by tribal members would constitute a positive impact on the Tribal economy. In addition to jobs for Tribal members, the applicant has indicated that training and development opportunities would be available for other Tribal members (PFS/ER 2001, p. 7.2-2). Finally, the purchase of ballast, sub-ballast, and asphalt paving from nearby firms would be a small but positive impact on the local economy.

5.5.2 Impacts During Operations

Direct impacts to socioeconomic and community resources are primarily associated with any physical changes to those resources that would result from operation of either of the two local transportation options. Indirect impacts are primarily associated with workers and families who might move into the area and place additional demands on existing resources. As discussed in the following paragraphs, both direct and indirect impacts are expected to be small.

5.5.2.1 New Rail Line from Skunk Ridge

Direct impacts of the proposed rail line for the movement of SNF from Skunk Ridge to the proposed PFSF would have small to moderate impacts to socioeconomic and community resources. This is because the change to the physical environment required for operation of the rail line impinges directly on livestock grazing resources (direct impacts to recreational resources and opportunities are addressed in Section 5.8.3). The increased risk of fire associated with use of the proposed rail line could also have a corresponding effect on the availability of livestock and wildlife forage in the event of a spark-induced fire (see Section 5.8.4). However, revegetated areas of the rail line may function as a green strip to help prevent the spread of fire (see Section 5.4.2.1). Such a fire barrier would minimize the potential impact from any spark-induced fires.

The socioeconomic and community resource impacts from operation of the rail line from Skunk Ridge to the proposed PFSF are a function of the anticipated traffic on this new line compared to the existing traffic on the main Union Pacific line. PFS plans no more than one or two round trips per week using the new rail line, and this volume of traffic is sufficiently small as not to result in any significant impacts (including impacts to grazing or recreational activities).

Indirect impacts are expected to be small, since the work force required to operate the proposed rail line, which is incorporated in the work force for operation of the proposed PFSF itself (see Section 4.5.2), is very small. Since the indirect impacts to socioeconomic and community resources associated with the PFSF workforce itself were small, they would likewise be small for operation of the proposed rail line.

5.5.2.2 New ITF Near Timpie

Direct impacts of using the ITF/heavy haul local transportation option are also expected to be small, although the use of Skull Valley Road to transport fabricated steel liners for the storage casks and 2 to 4 round trip shipments, per week, of SNF in shipping casks to the proposed project site, could result in possible delays for traffic along Skull Valley Road (see Section 4.5.2).

The socioeconomic and community resource impacts of using an ITF and transporting the SNF in canisters in heavy-haul tractor/trailers on Skull Valley Road to the proposed PFSF are a function of the amount of heavy-haul traffic on Skull Valley Road. PFS plans two to four round trips per week for the heavy haul transportation of casks along the 42-km (26-mile) segment of Skull Valley Road from the proposed ITF to the proposed PFSF (PFS/SAR 2001). The heavy haul tractor/trailers would move at a slow rate of speed [32 km/h (20 mph)], requiring other traffic to reduce travel speed or make additional passing maneuvers (PFS/SAR 2001). Utilization of heavy haul equipment for cask transportation would result in the transportation vehicle passing within approximately 15 m (50 ft) of two residences located along Skull Valley Road (PFS/SAR 2001). In addition, there is some potential for inconveniencing regular traffic along Skull Valley Road as a result of these movements, but the small number of round trips per week should result in no significant impacts.

Indirect impacts are also expected to be small, since the workforce required to operate the ITF, with the exception of the heavy haul truck drivers, are part of the work force for operation of the proposed PFSF itself (see Section 4.5.2). Since the indirect impacts to socioeconomic and community resources associated with the PFSF workforce itself have been determined to be small (see Section 4.5.2), they would likewise be small for operation of the ITF and heavy haul transportation option.

5.5.3 Impacts at the Alternative Site B

The alternative location (i.e., Site B) in Skull Valley for the proposed PFSF lies just south of the preferred site. Because Site B is very close to the preferred site, there would be no discernible differences in the anticipated impacts to socioeconomic and community resources during construction or operation for either of the local transportation options.

5.5.4 Mitigation Measures

Since the direct and indirect impacts of construction and operations for both local transportation options to socioeconomic and community resources are considered small to moderate, few mitigation measures are required.

The only socioeconomic and community resources that are potentially adversely affected by construction and operation of the proposed transportation facilities are (1) livestock, in that there could be disruptions to livestock management, including livestock movement across the tracks both within and between pastures for the new rail line option and (2) transportation, in that there could be increased traffic along Interstate 80 and Skull Valley Roads during construction, as well as for the ITF/heavy-haul option. Mitigations for these impacts are discussed in the following paragraphs.

The potential for impacts to livestock management arises due to conflicts between existing use of the land and its water resources and the construction and use of the proposed rail line. Any adverse impacts to grazing could be avoided or ameliorated by taking several actions, including the repair and maintenance of Pasture and Allotment division fences crossed by the proposed rail line in such a manner that livestock would not be able to cross from one area to the other (e.g., cattle guards); cooperating with the BLM and permittees to develop watering facilities east of the proposed rail route for the purposes of providing watering facilities for livestock and for use for fire suppression; providing livestock-secure fenceline crossings; and developing fire mitigation and detection plans in cooperation with BLM. The Cooperating Agencies propose that PFS be required to develop a plan to minimize impacts to livestock grazing activities during construction and operation (see Section 9.4.2).

The potential for traffic impacts arises due to the anticipated increase in the use of Skull Valley Road by construction and operation workers, as well as the possible use of heavy-haul vehicles under the ITF transportation option. The potential for adverse impacts to traffic during operations on Skull Valley Road would be greatest during the movement of fabricated steel liners and SNF to the proposed PFSF. The magnitude of such impacts are discussed above. Consideration should be given to the avoidance or amelioration of adverse transportation impacts by appropriate scheduling of facility-related traffic.

Degradation of the unimproved roads adjacent to the proposed rail line corridor could occur if these roads are used frequently by PFS or used to transport heavy materials. Therefore, the Cooperating Agencies propose that PFS be required to contact BLM prior to any use of the unimproved roads that could lead to their degradation (see Section 9.4.2). In addition, PFS could minimize the impacts to these roads by a number of actions, including covering them with gravel, occasionally blading the roads, or using a coating such as magnesium-chloride. Therefore, the Cooperating Agencies propose that PFS be required to develop a plan to minimize impacts to the unimproved roads, if PFS determines that continual use of such roads is necessary to transport either workers or materials (see Section 9.4.2).

5.6 Cultural Resources

5.6.1 Construction Impacts

5.6.1.1 New Rail Line from Skunk Ridge

As discussed below, impacts are expected to be small to moderate. Under the proposed action, development of the proposed Skunk Ridge transportation route would involve construction of a new rail siding at Skunk Ridge and construction of a rail line southward through the western portion of Skull Valley to Site A on the Reservation. An intensive field cultural resources survey of the proposed rail alignment has documented the presence of 12 historic period properties within the corridor (Birnie and Newsome 2000). Of the 12 sites, 8 are considered eligible for inclusion in the *National Register*, including the Hastings Cutoff (site 42TO709, which is part of the California National Historic Trail), U.S. Route 40 (site 42TO1409), the “new” Victory Highway (site 42TO1410), an old alignment of the Victory Highway (site 42TO1411), a late nineteenth- and early twentieth-century telegraph line (site 42TO1412), the Western Pacific Railroad (site 42TO1413), a segment of the Deep Creek Road, which may contain portions of the Beckwith Trail (site 42TO1416); and the Sulphur Spring or Eight-Mile Spring Road (site 42TO1417); which is part of the California National Historic Trail. Three of the remaining sites were evaluated as not possessing qualities that would make them eligible for inclusion on the *National Register*. These included a buried AT&T telephone line, remains of a gas station on the “New” Victory Highway, and a gas station location on U.S. 40. In each case, substantial deterioration in resource content and integrity resulted in the “not eligible” determination. Another site, a rock alignment and cairn (site 42TO1187), was also determined to be “not eligible” for listing on the *National Register* (see Section 1.5.5 and Appendix B).

Because of its high degree of physical integrity and association with significant historical events and people, the fairly well preserved segment of the historic emigrant trail known as the “Hastings Cutoff” (of the California National Historic Trail) (42TO709) is considered to be eligible for listing on the *National Register*. Because the proposed transportation corridor crosses the Hastings Cutoff segment at essentially a right angle, construction of the railroad would directly impact only a short segment of the trail. In addition to the physical integrity of the trail in this area, the Skull Valley setting is one without extensive development of modern intrusions. Therefore, the general environmental setting retains a visual impression of the original landscape during the westward migration of the mid-1800s. As a consequence, construction of the Skunk Ridge rail line will be an intrusion on both the cultural landscape aspect and physical vestiges of this historic episode.

The Cooperating Federal Agencies have concurred with the eligibility determination for the 8 sites for inclusion in the *National Register* and the four sites not eligible for inclusion (see Section 1.5.5 and Appendix B). In addition, the Cooperating Federal Agencies have determined that the proposed project would have adverse effects on some of these properties. The potential impacts along this corridor are expected to be moderate but could be mitigated prior to construction (see Section 5.6.5).

5.6.1.2 New ITF Near Timpie

As discussed below, impacts of the ITF are expected to be small. Use of the existing Skull Valley Road for heavy-haul transportation would involve construction of a new ITF near Timpie and use of the existing Skull Valley Road. Historic features present in the vicinity of the proposed ITF include a historic telephone line and the historic Union Pacific Railroad with associated features. An

archeological survey of this location revealed no archeological resources within the location itself (Birnie and Newsome 2000). Therefore, the potential for impacts to cultural resources at the ITF location is considered to be small.

As discussed in Section 3.6, there are several known prehistoric and historic properties in the vicinity, including the historic Timpie Railroad Siding, active and abandoned historic ranches, the former Iosepa town site, historic trails and the early Lincoln Highway route, and several recorded archaeological sites. The eastern side of the valley also includes known, but unrecorded, historic period tribal winter village sites, and many other important named places on the landscape. However, use of the Skull Valley Road with no improvements would not impact known cultural resources along that corridor. Therefore, the heavy-haul alternative from Timpie to the preferred site on the Reservation would have a small potential for impacts to cultural resources.

5.6.2 Impacts During Operations

Normal operational activities to transport SNF to the PFSF on the Reservation are not expected to have potential for impacts to cultural resources since no additional ground disturbance will occur. Therefore, the overall potential for impacts is expected to be small.

5.6.3 Impacts at the Alternative Site B

The potential for transportation related impacts to cultural resources should the proposed PFSF be constructed at Alternative Site B on the Reservation are essentially the same as for Site A, and are expected to be small to moderate. Impacts from the ITF are expected to be small.

5.6.4 Native American Cultural Resources

Based on the Section 106 consultation process with regional Federal Recognized Indian Tribes and other organizations (see Section 1.5.5) and comments received during public scoping meetings, there are no identified traditional cultural properties or other traditional cultural resources known to exist along the Skunk Ridge rail corridor or at the ITF location. The former Native Hawaiian townsite of Iosepa and the currently protected associated cemetery lie adjacent to the Skull Valley Road, but would not be affected by construction or heavy haul traffic since the road itself would not be altered. Based on the known information regarding the presence of traditional cultural places along the transportation features, the potential impacts to such resources are considered to be small.

5.6.5 Mitigation Measures

As part of the consultation process required by Section 106 of the NHPA, a draft Agreement has been prepared that outlines agreed-upon measures that PFS will take to avoid, minimize, or mitigate these adverse effects (see Appendix B and Section 1.5.5). The Agreement contains a commitment to develop a Treatment Plan that includes specific mitigation measures for cultural resources within the proposed area. These mitigation measures include documentation, avoidance as much as possible during construction by barricading and development of education material (see Section 1.5.5 and Appendix B). Because the potential to find buried cultural resources also exists, the Agreement also specifies that a Discovery Plan for previously unencountered sites will be appended to the Treatment Plan. A final Treatment Plan will be completed prior to any construction of the proposed rail line.

In view of the above, the Cooperating Agencies propose that PFS be required to implement all mitigation measures set forth in the Memorandum of Agreement developed as part of the consultation process under Section 106 of the NHPA (see Section 9.4.2). In addition, the Cooperating Agencies propose that, if PFS identifies any previously unrecorded artifacts or other cultural resources during construction activities on land under the jurisdiction of BLM, PFS be required to immediately cease construction, inform BLM of the identified resources, and arrange for evaluation of the resources by a qualified individual (see Section 9.4.2).

5.7 Human Health Impacts of SNF Transportation

This section discusses the radiological and non-radiological human health impacts associated with transportation of SNF from nuclear power plants to the proposed PFSF in Skull Valley. For cross-country transportation to the proposed PFSF, only shipments by rail are analyzed because PFS plans to receive only rail casks under its NRC license. However, also considered are rail shipments that might involve a short highway (or barge) segment to reach a rail line, for reactor sites that do not have direct rail access, or if an ITF is constructed in Skull Valley. This FEIS also documents an evaluation of impacts of transporting SNF from the PFSF to the western border of Utah, on its way to a permanent repository in the western United States. A DEIS prepared by DOE (DOE 1999) addresses in detail the national and regional transportation impacts of building and operating a proposed permanent repository at Yucca Mountain, Nevada. The NRC staff performed an additional assessment of shipment of SNF from the proposed PFSF to a permanent repository. Congress, in the Nuclear Waste Policy Act, as amended (NWPA), has directed the DOE to study one candidate repository, namely, a repository proposed at Yucca Mountain, Nevada. To reflect the provisions of the NWPA, the NRC staff has examined the shipment of SNF via rail from the proposed PFSF, on its way to a permanent repository in the western United States, as if such a repository were located at Yucca Mountain, Nevada, although that location may or may not become the actual repository. Accordingly, the NRC staff examined the shipment of SNF via rail from the proposed PFSF through Black Rock, Utah, to the Utah-Nevada border. It should be noted that the NRC has not received an application requesting a license for a permanent geologic repository, and the NRC has not made any determination regarding any proposal to construct such a repository at Yucca Mountain, Nevada, or any other location.

The non-radiological human health impacts discussed in this section include (1) the occupational hazards from construction and operation of the proposed rail line and an ITF; (2) the safety impacts associated with increased rail traffic, which include an analysis of the increase in traffic accidents (e.g., derailments, crossing accidents) attributable to the additional rail traffic; and (3) human health effects due to vehicle exhaust emissions along the rail lines during transport of SNF to the proposed PFSF. The potential non-radiological impacts would also include socioeconomic impacts (see Section 5.5) and environmental justice impacts (see Section 6.2).

5.7.1 Non-Radiological Impacts

5.7.1.1 Potential Worker Injuries During Construction and Operation of Transportation Facilities

Potential health impacts to workers during construction and operation of transportation facilities in Skull Valley would be limited to the normal hazards associated with the construction and operational

activities of these facilities (i.e., no unusual situations would be anticipated that would make the proposed construction activities more hazardous than normal for a major industrial construction project). The impacts of these hazards include fatal and nonfatal occupational injuries that may result from overexertion, falls, or being struck by equipment (NSC 2000). Because there are no unusual situations anticipated to make the construction-related activities more hazardous than normal, there would be only small impacts to worker health and safety due to occupational construction-related activities. As discussed below, the non-radiological health effects are judged to be small.

During the construction and operation of either the proposed rail line or the ITF, non-radiological pollutants of concern to worker and public health would include the criteria pollutants and dust (both of which are addressed in Section 5.3). With adequate control measures, such as treating areas with water or chemical surfactants for dust suppression, etc., the impact on worker and public health would be expected to be small. There are no other potential non-radiological health impacts to the public from the proposed project, since members of the general public would not be allowed on the construction sites. Therefore, only fatal and nonfatal occupational injuries warrant any further analysis. These types of injuries are discussed below.

In order to estimate the number of potential fatal and nonfatal occupational injuries due to the construction, normal operations, and decommissioning of transportation facilities in Skull Valley, data on fatal occupational injuries per 100,000 workers per year and data on nonfatal occupational injuries with days of work lost per 100 full-time workers per year were identified in "Injury Facts" (NSC 2000). The data tables reflect input from both BLS and OSHA. These BLS and OSHA data for the construction, trucking and railroad industries were used to estimate the potential fatal and nonfatal occupational injuries for the construction and normal operations of the proposed transportation facilities in Skull Valley. Table 5.4 presents the number of fatal and nonfatal occupational injuries during the construction and normal operations of both the proposed rail line and the ITF.

Table 5.4. Estimated numbers of fatal and nonfatal occupational injuries for the construction and normal operations for the proposed rail line and the ITF

Activity	Duration of activity	Predicted number of fatal injuries	Predicted number of nonfatal injuries
Construction			
Rail line	14 months	0.020	4.8
ITF	1 year	0.0051	1.2
Operations			
Rail line	40 years ^a	0.009	1.7
ITF	40 years ^a	0.017	5.1

^a40 years includes 20 years of operations under the requested NRC license and 20 years of operations under a renewed license, if any.

Source: National Safety Council (2000). "Injury Facts," 2000 edition, Itasca, IL.

Potential worker injuries during construction. The transportation facilities would be subject to OSHA'S General Industry Standards (29 CFR Part 1910) and Construction Industry Standards (29 CFR Part 1926). Construction risks can be minimized by adherence to the procedures and policies required by OSHA and the state of Utah. These standards establish practices, procedures,

exposure limits, and equipment specifications to preserve employee health and safety. In addition OSHA inspections can also be employed in an effort to reduce the frequency of accidents and further ensure worker safety.

Potential fatalities. The construction of the proposed rail line would require a peak work force of 125 workers and would be completed in 14 months. Based on data presented in NSC (2000) for construction worker fatal occupational injuries (i.e., fatalities), the number of fatalities over the construction period is estimated to be 0.02 (i.e., less than one). This estimate is conservative, because it assumes that a work force of 125 workers (the estimated peak workforce) would be employed for the entire construction period.

The construction of the ITF would require a peak workforce of 35 workers and would be completed in less than one year. The number of fatalities during the construction of the ITF was estimated to be 0.005 (i.e., less than one). This estimate is also conservative, because it assumes a force of 35 workers (the estimated peak workforce) would be employed for the entire construction period.

Potential nonfatal occupational injuries. Based on BLS statistics for construction worker nonfatal occupational injuries, the number of nonfatal injuries (that include lost workdays) over the 14-month construction period of the rail line is estimated to be 4.8. Based on BLS statistics for construction worker nonfatal occupational injuries, the number of nonfatal injuries (that include lost workdays) over the 1-year construction period for the ITF is estimated to be 1.2.

Potential worker injuries during operations. Following the construction of either of the two transportation facilities, SNF would be transported from the northern portions of Skull Valley to the proposed PFSF. Worker injuries may occur during these local transportation activities.

Potential fatalities. Operation of the proposed rail line would involve two employees operating a locomotive to move SNF to the proposed PFSF. These activities would occur over a 40-year period, including the receiving of SNF shipments and the shipment of SNF away from Skull Valley to a permanent repository. Based on BLS statistics of the railroad transportation industry, the number of fatalities during normal operations over 40-years is estimated to be 0.009 (i.e., less than one).

Operation of the ITF would require a four-man crew to move SNF on Skull Valley Road. These activities would also occur over a 40-year period. Based on BLS statistics for the trucking and warehousing industry, the number of fatalities during normal operations over 40-years is estimated to be 0.017 (i.e., less than one).

Potential nonfatal occupational injuries. An analysis of the railroad transportation industry's statistics indicates that approximately 1.7 nonfatal injuries that involve lost workdays would occur on the proposed rail line during normal operations over 40 years.

For operation of the ITF and the heavy-haul vehicles down Skull Valley Road, approximately 5.1 nonfatal injuries would involve lost workdays during normal operations over 40-years. This includes the risks of activities involving the transfer of SNF casks from railcar to truck at the ITF, as well as transportation of SNF by heavy-haul vehicles on Skull Valley Road.

5.7.1.2 Rail Traffic Accidents

The proposed PFSF will have the capacity to store 4,000 casks. PFS has indicated that on average there would be 50 incoming shipments per year carrying four spent fuel casks each. On the basis of this information, the shipping campaign would last 20 years. The casks would eventually be shipped to a national repository for final disposal. Based on the Waste Confidence Rule in 10 CFR 51.23, a permanent repository will be available within the first quarter of the twenty-first century. If the proposed PFSF operates as described by the applicant, SNF would be shipped directly from the PFSF to a permanent repository. For purposes of this analysis, it is assumed that the PFSF could be emptied in 10 years by placing four casks on each train and making 100 shipments per year. Assuming 10 years of on-site storage with no incoming or outgoing SNF shipments, it can be inferred that the PFSF would then be operational for a total of 40 years (20 years under an initial license, and 20 years under a renewed license). As indicated above, operation of the proposed PFSF for 40 years is bounding with respect to effects on human health.

The NRC staff determined that the average distance by rail to the proposed PFSF from nuclear power reactors east of the proposed site in Skull Valley is 3,410 km (2,119 miles); the distance is less for nuclear power reactors west of the proposed PFSF. If each SNF train travels an average of 3,410 km (2,119 miles), the total distance covered by the trains for the entire campaign for shipping 4,000 SNF canisters (at one per railcar) to the facility will equal 13.6×10^6 railcar-km (8.5×10^6 railcar-miles). For trains eventually transferring casks away from the proposed PFSF to the proposed (or similar) permanent repository, the rail distance is estimated to be 950 km (590 miles). Thus, the total distance covered by trains in transferring all casks to the national repository would be 3.8×10^6 railcar-km (2.4×10^6 railcar-miles). Therefore, the total distance associated with the entire lifetime set of operations (i.e., both receiving SNF at and shipping SNF from the proposed PFSF) would be 17.4×10^6 railcar-km (10.8×10^6 railcar-miles). A round-trip calculation is included in this analysis to provide an upper bound on the number of railcar-km. The round-trip distances for the lifetime set of operations would then be 34.8×10^6 railcar-km (21.6×10^6 railcar-miles).

Vehicle-related accident risks involve accidents that result in injuries and fatalities that are not related to the cargo being shipped. Saricks and Kvitek (1994) examined these risks and found—based on national average accident statistics—that, considering all injuries and fatalities associated with regular trains, the rates were 4.26×10^{-8} injuries per railcar-km and 2.27×10^{-8} fatalities per railcar-km. Thus, the risk to the public from the shipping campaigns needed to get SNF to Skull Valley and then move it to a proposed national repository would be:

$$\begin{aligned} (4.26 \times 10^{-8} \text{ injuries/railcar-km}) \cdot (34.8 \times 10^6 \text{ railcar-km}) &= 1.48 \text{ injuries, and} \\ (2.27 \times 10^{-8} \text{ fatalities/railcar-km}) \cdot (34.8 \times 10^6 \text{ railcar-km}) &= 0.78 \text{ fatalities} \end{aligned}$$

over the 40 year assumed lifetime of the proposed PFSF. Because these are very small risks over the assumed 40-year life of the proposed facility, the staff finds these potential impacts to be small.

Saricks and Kvitek (1994) also noted that dedicated trains—such as would be used to transport spent nuclear fuel—spend much less time in rail yards than do regular trains, since dedicated trains do not undergo classification; thus, it appears that the injuries and fatalities based on national averages are not as relevant for dedicated trains as they are for regular trains. Should the large portion of casualties which occur in rail yards be excluded from the national averages, the injury rate would decrease by a factor of almost 7 and the fatalities would decrease by a factor of about 36.

5.7.1.3 Latent Health Effects

The cross-country shipment of SNF could involve non-radiological health risks associated with the generation of air pollutants by the vehicles during shipment, independent of the nature of the type of cargo being shipped. The health endpoint assessed under routine transport conditions is the risk of excess (additional) latent mortality caused by inhalation of vehicular exhaust emissions. The risk factor for latent mortality from pollutant inhalation, as generated by Rao et al. (1982), is 1.3×10^{-7} latent fatalities per train-km for rail transport in urban areas. This risk factor is based on regression analyses of the effect of sulfur dioxide and particulate releases from diesel exhaust on mortality. Vehicle-related risks from routine transportation are calculated for each case by multiplying the total distance traveled in urban areas by the appropriate risk factor. Similar risk factors are not available for rural and suburban areas.

If it is conservatively assumed that the total population along the rail routes is “urban,” then the total indirect risk to the public from the non-radiological impacts of SNF transportation can be computed as:

$$(1.3 \times 10^{-7} \text{ latent fatalities/train-km}) \cdot (34.8 \times 10^6 \text{ railcar-km}) \\ \div (4 \text{ railcars per train}) = 1.14 \text{ latent fatalities.}$$

Because this is a very small risk over the assumed 40-year lifetime of the proposed facility, the staff finds this impact to be small.

5.7.2 Radiological Impacts

The radiological dose impacts for both the cross-county and regional transportation of SNF to and from the PFSF are discussed in this section. In addition, the economic impacts of cleaning up a postulated release of activity from a cask are examined.

To assess nationwide impacts, a representative route approach is used. In this approach, the NRC staff analyzed transportation of SNF to the proposed PFSF as if all the spent fuel to be stored there originated from one location—the Maine Yankee nuclear power plant (even though the Maine Yankee plant itself would never have that much spent fuel to ship). This route is one of the longest possible routes that any individual shipment could experience, and also passes through some of the most populated regions of the country. Maximizing these factors tends to conservatively overestimate the transportation risks. Thus, the overall risks estimated using this route are expected to adequately characterize risks of shipments to and from the PFSF, regardless of their individual origins, transportation details (such as use of intermodal transfer), and reasonably foreseeable route characteristics. To provide additional information regarding the potential environmental impacts of intermodal operations near reactor sites (e.g., heavy haul truck to a rail head and truck-to-railcar cask transfer), illustrative examples of such operations are also assessed.

This section also presents impacts in and near Utah, and it presents the incident-free and accident dose risk estimates assuming the SNF is shipped via the alternative of an ITF near Timpie. For this alternative, SNF would first be transported by rail to the siding at Timpie (i.e., the ITF) and then by heavy-haul vehicle southward on Skull Valley Road to the PFSF.

In the past, the NRC has performed a number of generic studies on the transportation of radioactive materials (including SNF) that can be compared with the findings in this FEIS. Notable among these studies are the 1972 WASH-1238 study and the 1977 NUREG-0170 study, as described below.

LATENT CANCER FATALITIES

One measure of risk used in this section is the latent cancer fatality (LCF). A latent cancer fatality is a death from cancer resulting from, and occurring an appreciable time after, exposure to ionizing radiation. The probability of developing a fatal cancer from exposure to 1 rem of ionizing radiation is estimated to be 0.0005 (5 chances in 10,000). The coefficients or factors used for health effects in this FEIS for the public and occupational radiation risk are 5×10^{-4} and 4×10^{-4} health effects/rem, respectively. These coefficients are based on data obtained at much higher doses and dose rates than those encountered by the general public or workers. A linear extrapolation from the lowest doses at which effects are observable down to the occupational range was used to generate these coefficients. The assumption of a linear extrapolation has considerable uncertainty, but is believed to present a conservative estimate of the risk.

In a population of 10,000 people, national statistics indicate that about 2,224 people would die from cancer of one form or another. Using information developed by the International Commission on Radiological Protection, if all 10,000 people received a dose of 200 millirem (in addition to the normal background radiation dose), 1 additional cancer fatality would be estimated to occur in that population. However, we would not be able to tell which of the 2,225 fatal cancers was caused by radiation, and the additional radiation might possibly cause no fatal cancers.

Sometimes, calculations of the number of latent cancer fatalities associated with radiation exposure do not yield whole numbers, and may in fact yield numbers less than 1.0. For example, if each individual in a population of 100,000 received a total dose of 0.001 rem, the collective dose would be 100 person-rem and the corresponding estimated number of latent cancer fatalities would be 0.05 (that is $100,000 \text{ persons} \times 0.001 \text{ rem} \times 0.0005 \text{ latent cancer fatality per person-rem}$). Because this numerical result is less than 1 fatality, further interpretation (as discussed below) is required. The result must be interpreted as a statistical estimate. That is, 0.05 is the *average* number of deaths that would result if the same exposure situation were applied to many different groups of 100,000 people. For most groups, no single individual would incur a latent cancer fatality from the 0.001 rem dose each person would have received. In a small fraction of the groups, 1 latent fatal cancer would result; in exceptionally few groups, 2 or more latent fatal cancers would occur. The *average* number of deaths over all of the groups would be 0.05 latent fatal cancer (just as the average of 0, 0, 0, and 1 is $1/4$ or 0.25). For the scenario under discussion, the most likely outcome for any single group of exposed persons is 0 latent cancer fatalities.

Overall, these earlier studies concluded that the incident free impacts from transportation are small, and that the risks from accidents are lower than the incident free impacts. WASH-1238, "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants," (December 1972), and Supplement 1 thereto, NUREG-75/038 (April 1975), led to codification of the NRC's conclusions regarding the environmental impacts of shipping fuel to and waste from a reactor. These impacts are codified in Table S-4 in 10 CFR Part 51. The conclusions set forth in Table S-4 may be used in environmental impact statements for licensing nuclear power reactors in lieu of a specific assessment of transportation impacts, provided that a specific set of conditions is satisfied. These conditions are set forth in 10 CFR 51.52(a). The NRC reviewed 10 CFR 51.52(a) and determined that PFS did not satisfy all of the conditions; therefore, the NRC staff has performed a more detailed assessment of the proposed PFS transportation activities. The NRC staff has compared the results of this assessment with the results from NUREG-0170, "Transportation of Radioactive Material by Air and Other Modes," (December 1977), a previous generic assessment that explicitly considered the impacts of shipping SNF from multiple reactor sites. The sections that follow present these results, as do Appendices C and D (but in greater detail). For context, a brief

comparison of this FEIS, NUREG-0170, and Table S-4 is provided in Section 5.7.2.3. In short, the assessment demonstrates that the impacts associated with the transportation activities connected with the proposed action fall within the impacts stated in either Table S-4 or NUREG-0170, and characterized as small in them.

5.7.2.1 Summary of Findings

This section summarizes the results of the cross-country transportation analyses performed for this FEIS. Details of the analyses that were performed are presented in later sections. Results are presented and compared to those of NUREG-0170. NUREG-0170 is used by NRC and the DOT as a basis to determine the adequacy of the regulations (10 CFR Part 71 and various parts of 49 CFR) governing radioactive materials transportation. The annual radiological impacts of transportation calculated in this study and NUREG-0170 are summarized in Tables 5.5, 5.6, and 5.7. It should be noted that comparing the LCF predictions from NUREG-0170 and those obtained through this analysis are not straightforward because different models were used to estimate the values. However, the results from both studies show that the estimated LCFs associated with the transport of SNF would be small.

Table 5.5. Annual incident-free SNF transportation doses^a

	Number of shipments per year	Incident-free dose [person-Sv (person-rem)]	
		Rail	ITF
Reactor site to proposed PFSF	200	0.104 (10.4)	0.23 (23)
Proposed PFSF to a final repository ^b	200	0.00298 (0.298)	0.069 (6.9)
NUREG-0170	652	2.98 (298)	—

^aIncludes doses to the public, transportation workers, and workers handling fuel at the ITF.

^bEvaluates transportation impacts from the proposed PFSF to the Utah-Nevada border.

Comparing Tables 5.6 and 5.7, the estimates of incident free risk exceed the estimate of accident risk for the PFSF shipments, using RADTRAN4, and measuring risk using population dose and LCFs. The population dose, which is directly proportional to the LCF, is determined by summing the doses to each person in the exposed population [for example, a dose of 0.01 Sv (1 rem) to 10 people or a dose 0.02 Sv (2 rem) to 5 people are both 0.1 person-Sv (10 person-rem)]. During incident-free transport, a larger number of people are exposed to a small radiation dose as each cask moves by; however, the accident dose risk involves estimating the probability of a severe accident itself, and then potentially a much larger exposure but to a much smaller number of people.

Based upon the discussion set forth in this FEIS, the NRC staff concludes that the radiological doses from transportation of SNF, by rail only or via the ITF, from existing reactor sites to the proposed PFSF and from PFSF to a permanent repository are small. Further, the results indicate that the estimated doses resulting from shipments of SNF to the proposed PFSF on the representative route are a small fraction of the doses reported in NUREG-0170.

Table 5.6. Annual expected latent cancer fatalities (LCFs) for incident-free SNF transport

	Number of shipments per year	Incident-free risk (LCF)	
		Rail	ITF
Proposed PFSF	200	5.08×10^{-3}	1.02×10^{-2}
NUREG-0170 ^a	652	3.60×10^{-2}	—

^aBased on the estimates in NUREG-0170 that 1 percent of the LCFs from transportation of all radioactive material would occur from rail shipment of SNF.

Note (1): Includes doses to the public, transportation workers, and workers handling fuel at the ITF.

Note (2): For an explanation of the numerical LCF values, please refer to the dialogue box in Section 5.7.2.

Table 5.7. Annual expected latent cancer fatalities (LCFs) for potential accident risk to the public during SNF transport

	Number of shipments per year	Accident risk (LCF)	
		Rail	ITF
Proposed PFSF	200	2.12×10^{-3}	2.12×10^{-3}
NUREG-0170 ^a	652	8.00×10^{-1}	—

^aBased on the estimates in NUREG-0170 that 1 percent of the LCFs from transportation of all radioactive material would occur from rail shipment of SNF.

Note: For an explanation of the numerical LCF values, please refer to the dialogue box in Section 5.7.2.

5.7.2.2 Approach to Analysis

The approach of this analysis is to estimate the overall magnitude of the annual radiological doses resulting from transport of SNF to the proposed PFSF. To complete the analysis, the potential radiological impacts from incident-free transport and potential transportation accidents associated with shipping SNF to and from the proposed PFSF were estimated. Those results were then examined to determine if the impacts of the transportation to and from the proposed PFSF were consistent with the results of NUREG-0170. See Section D.2 in Appendix D. of this FEIS for a brief discussion of NUREG-0170.

In this analysis, the RADTRAN4 computer code (Neuhauser 1992) was used to model both the overall incident-free radiological exposure and the consequences of radiological releases due to severe accidents. The route and population density numbers used by RADTRAN4 were generated by the INTERLINE computer code to estimate the impacts of shipping SNF to and from the proposed PFSF. Future changes in the population density were considered in estimating the impacts from shipping

SNF to and from the proposed PFSF. Appendix C discusses the INTERLINE route analyses and Appendix D discusses the RADTRAN4 analyses. The human health risks of the radiological exposures are expressed as LCF values. (See Section 3.7 for the definition of LCF.) Radiation-dose-to-cancer-risk factors from the National Academy of Sciences (NAS 1990) [i.e., 5×10^{-2} LCF/Sv (5×10^{-4} LCF/rem) for the general public and 4×10^{-2} LCF/Sv (4×10^{-4} LCF/rem) for workers] were used to estimate the LCF values.

Many “conservative” assumptions were used in this assessment to provide reasonable assurance that the impacts of the actual activity, if it occurs, are less than those estimated.

This assessment’s RADTRAN4 computations use the accident rates, event trees, and release fractions developed in NUREG/CR-4829, *Shipping Container Response to Severe Highway and Railway Accident Conditions*, February 1987 (frequently referred to as the Modal Study). The Modal Study was conducted by Lawrence Livermore National Laboratory in support of NRC’s efforts to further examine the level of safety provided by its regulations with respect to accident conditions. The Modal Study also examined transport cask response to accidents by using computer modeling of generic cask responses to accident forces. In this assessment, six increasingly severe categories of accidents were assessed that encompass the twenty accident ‘bins’ that were analyzed in the Modal Study (see Appendix D for details). The Modal Study results indicated that SNF shipment risks were about one-third less than those previously estimated in NUREG-0170. The NRC staff concluded from the Modal Study that NUREG-0170 clearly bounded spent fuel shipment risks.

5.7.2.3 Assumptions and Analysis as Compared to NUREG-0170

Because the approach to this assessment (see Section 5.7.2.2) involves comparison of results to NUREG-0170 results, this section describes some of the assumptions and methodologies of this study and NUREG-0170. These comparisons are arranged by topical area in the following paragraphs. Additionally, information on the relationships, assumptions, and results of several transportation risk studies is presented at the end of this section.

Route and shipment parameters. Table 5.8 describes attributes of the generic routes used in NUREG-0170 and the representative route used in this FEIS. The radiological impacts for both incident-free transportation and possible transportation accidents are sensitive to these variables, particularly route length, so choosing a route that tends to maximize them is a conservative approach. The majority of the fuel (over 90 percent) would arrive at the proposed PFSF from eastern reactor sites. In order to develop an estimate of the total risk of cross-country shipments of SNF to the proposed PFSF, the NRC staff has taken a very conservative assumption that all 40,000 MTU of SNF would be shipped to the PFSF from the Maine Yankee plant, 16 km (10 miles) north of Bath, Maine. The route selected for this analysis is 4,476 km (2,781 miles) in length (see Figure 5.1) and passes through large population centers of Schenectady, New York; Buffalo, New York; Cleveland, Ohio; Toledo, Ohio; Gary, Indiana; Chicago, Illinois; Ogden, Utah; and Salt Lake City, Utah. The route is described in detail in Appendix C. Using this cross-country route in the transportation analysis results in a conservative estimate of the national transportation impacts of the proposed action. As compared to NUREG-0170, this route is much longer and over this route, a much larger number of people would be exposed to each SNF shipment than assumed in NUREG-0170.

Table 5.8. Spent fuel route data as used in this analysis and in NUREG-0170^a

Parameter	Maine Yankee to PFSF		NUREG-0170 rail route
	Rail to PFSF	Rail to ITF ^b	
Route length (km)	4,476	4,431	1,210
Urban fraction	0.043	0.044	0.05
Suburban fraction	0.23	0.24	0.05
Rural fraction	0.73	0.72	0.9
Population densities (people/km²)			
Urban	2,552	2,552	3,861
Suburban	335	335	719
Rural	9	9	6
Population assumed exposed per shipment (number of people)			
1990 population	864,029	864,029	NA
Estimated population in 2020 ^c	1,123,238	1,123,238	NA
NUREG-0170 (1985)	NA	NA	277,743
Shipments per year (single cask)			
Maine Yankee to PFSF (incident-free)	200 ^d	200	NA
Maine Yankee to PFSF (accident)	50 ^d	50	NA
NUREG-0170 (1 cask per shipment)	NA	NA	652

^aTo convert kilometers to miles, multiply by 0.62. To convert people per square kilometer to people per square mile, multiply by 2.59.

^bThe 42 km between the ITF and the PFSF is all rural with a density of 1.3 people per km².

^cCalculated as a 30-percent increase in the 1990 population.

^dAnnual average of 50 shipments of 4 casks each. Each cask acts as an individual radiation source for incident-free analysis, and all 4 casks are assumed to have a release in the accident analysis.

PFS estimates that the PFSF would receive approximately 200 casks per year. PFS also indicated that each train would average four casks; therefore, the proposed PFSF is expected to receive an average of approximately 50 train shipments per year. For the incident-free RADTRAN4 analysis, the dose at any point as a four-cask train passes by is mathematically the same as the dose from four one-cask trains. Therefore, to simplify the incident-free analysis, RADTRAN4 was used to calculate the impact on the public assuming that all 200 casks are shipped, one cask per train; and the result was then multiplied by 200 to obtain the annual impacts. For the accident analysis it was conservatively assumed that 50 shipments of 4 casks each are made per year, and that all of the casks experience a release of the same magnitude (see Section 5.7.2.5 for additional detail).

If the proposed rail line from the Union Pacific mainline at Skunk Ridge were not constructed to the proposed PFSF, an ITF would be constructed near the Timpie siding. Heavy-haul vehicles would use Skull Valley Road to move the SNF casks from the ITF to the proposed PFSF site. The rail route from Maine Yankee to the ITF would be nearly identical to the route described for rail shipment between Maine Yankee and the proposed PFSF, except the rail route would terminate at the Timpie siding, where the SNF shipping casks would be transferred to heavy haul trucks. This rail route is 4,389 km (2,727 miles) long. The heavy-haul route from the proposed ITF near Timpie to the proposed PFSF site is 42 km (26 miles) long.

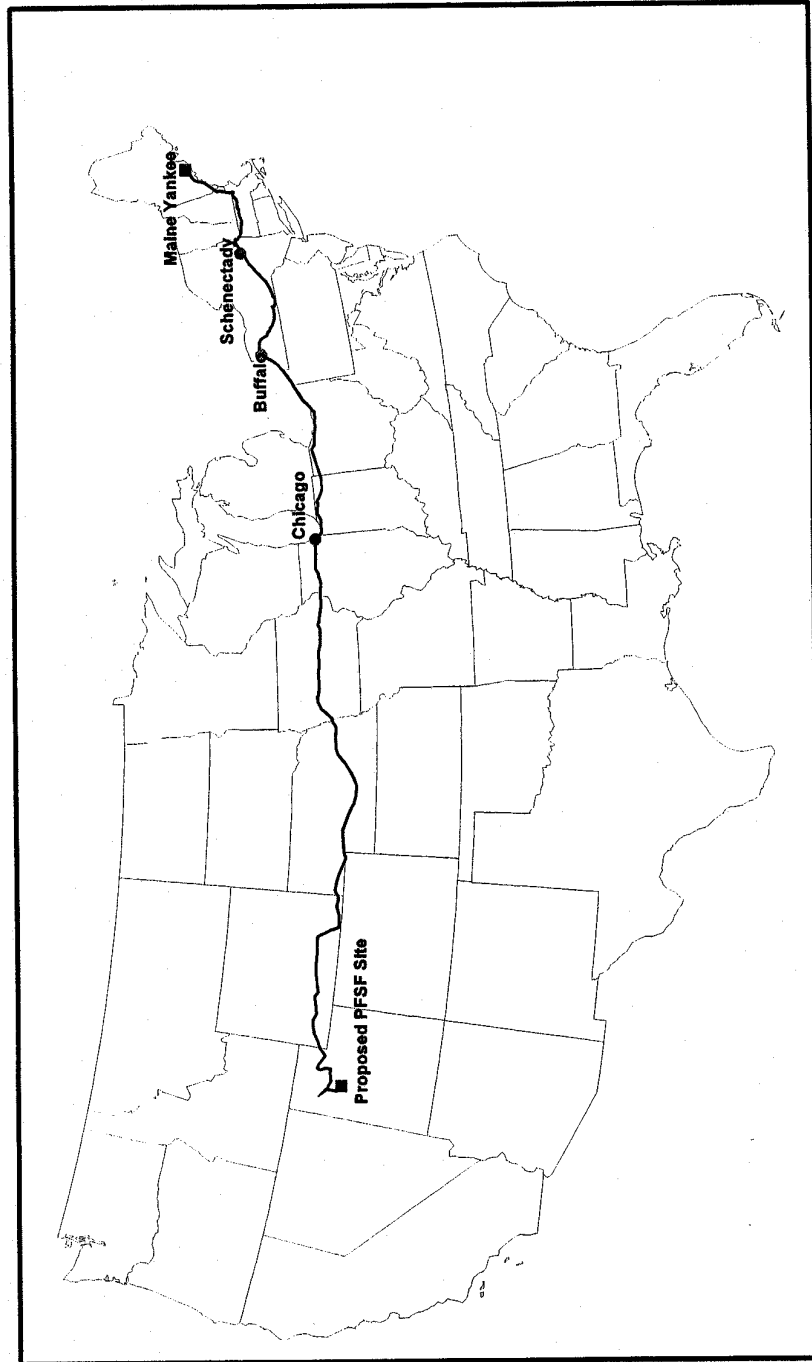


Figure 5.1. Modeled rail route from the Maine Yankee nuclear power plant to the proposed PFSS in Skull Valley, Utah.

The NRC staff performed an additional assessment of shipment of SNF from the proposed PFSF to a permanent repository. Congress, in the Nuclear Waste Policy Act (NWPA), as amended, has directed the DOE to study one candidate repository, namely a repository proposed at Yucca Mountain, Nevada. To reflect the provisions of the NWPA, the NRC staff has examined the shipment of SNF via rail from the proposed PFSF on its way to a permanent repository in the western United States as if such a repository were located at Yucca Mountain, Nevada, although that location may or may not become the actual repository. Accordingly, the NRC staff examined the shipment of SNF via rail from the proposed PFSF through Black Rock, Utah, to the Utah-Nevada border. It should be noted that the NRC has not received an application requesting a license for a permanent geologic repository, and the NRC has not made any determination regarding any proposal to construct such a repository at Yucca Mountain, Nevada, or any other location.

The route analyzed in this EIS stopped at the Utah-Nevada border (see Figure 5.2) because shipment plans beyond the border are subject to decisions of the DOE that have not yet been made (for example, the locations of intermodal transfer points or new direct-access rail lines). DOE is analyzing the national and Nevada-regional transportation impacts of building and operating a repository as proposed at Yucca Mountain (DOE DEIS 1999). Further, as discussed below, regardless of the destination location, the nationwide impacts of shipments from PFS after storage are bounded by the FEIS nationwide impacts assessment of shipments to PFS.

Population and population growth. All RADTRAN calculations were carried out using population density information from the U.S. Census Bureau for the year 1990, the latest year for which detailed census information was available when the evaluation was prepared. That information provides not only data on the number of people all over the United States, but also identifies where they live. Since that time, the U.S. population has grown, and this growth is expected to continue. Currently the U.S. Census Bureau has projected growth in the country to the year 2100, but projections are not available as to where the new people will live. To account for the population increase on cross-country routes to the proposed PFSF, the population exposures generated by RADTRAN have been multiplied by the ratio of the population projected for the year 2020 to the actual population in the year 1990. Information from the U.S. Census Bureau indicates that with an average growth rate, the population of the United States will reach 325 million in the year 2020. Since the U.S. population was 250 million in 1990, the projected increase is 325/250, or 30 percent. The number of people exposed during shipments of SNF to the proposed PFSF have been increased by 30 percent to account for population growth. Specifically, the dose and risk values that were obtained using the RADTRAN4 program were increased by 30 percent and the higher values are reported in this FEIS. Using the 1990 Census data, it is estimated that 864,029 people would live within 800 m (0.5 mile) of the rail route from Maine Yankee to the proposed PFSF. Considering the 30-percent increase, it is projected that 1,123,238 people would live within 800 m (0.5 mile) of the route from the Maine Yankee to the proposed PFSF. Both of these populations are much larger than the population (277,743 people) considered in NUREG-0170.

In 1990 the population of Utah was approximately 1.72 million. Based on U.S. Census Bureau information projected out to the year 2040, the state should reach a population of approximately 3.38 million, or approximately twice the 1990 population. Therefore, the data generated by RADTRAN4 for shipments from the PFSF to a permanent geological repository was multiplied by two to account for the increase in population at the projected time when these shipments would be made.

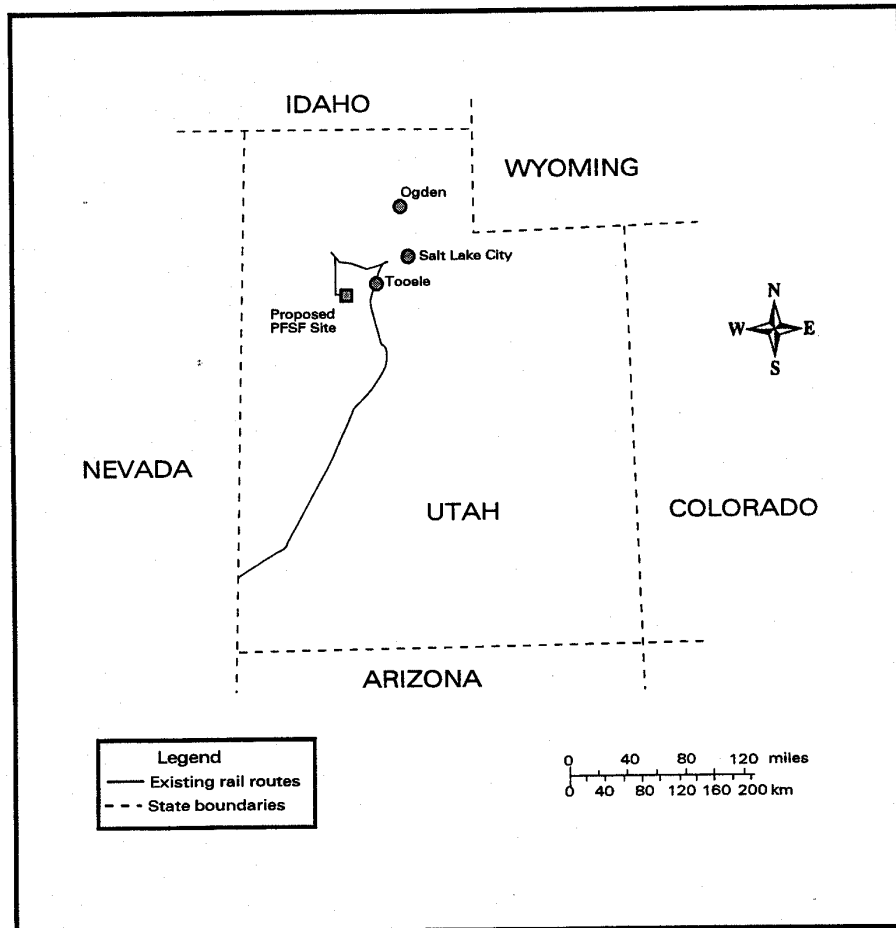


Figure 5.2. Rail route modeled for shipping SNF from Skull Valley, Utah, toward a national repository.

Package inventories and dose rates. Incident-free radiological dose was estimated by calculating a total body dose for the transport crew and the general population based on the radiation dose rate at 1 m (about 3 ft) from the shipping cask surface. The source term was conservatively assumed to consist entirely of gamma radiation for calculation of the incident-free dose. Actual cask radiation levels are measured prior to each shipment and in practice are expected to be lower than the regulatory limit. Each cask was assumed to have a dose rate of 0.13 mSv/hr at a distance of 1 m (13 mrem/hr at 3 ft) from the cask surface, which is equivalent to the regulatory limit of 0.1 mSv/hr at 2 m (10 mrem/hr at 6.5 ft.). As for accident calculations, because of the specific radionuclide content of PWR fuel assemblies and the number of assemblies inside each cask, PWR assemblies would produce a greater dose than BWR fuel assemblies in the event of an accident that breaches the cask. Accordingly, the staff performed the analysis based on PWR fuel. Each cask is assumed to contain 24 PWR fuel assemblies with a burnup of 40,000 MW-day/MTU and that have been cooled for 5 years. A representative subset of the radionuclides, which included all radionuclides that could significantly contribute to accident dose risk, was assessed. NUREG-0170 assumed that a rail cask would carry no more than 7 PWR assemblies, and that the cask dose rate was likewise 0.1 mSv/hr at 2 m (10 mrem/hr at 6.5 ft) under normal conditions.

Accident release fractions and release fraction probabilities. The risk associated with radiation exposure from releases of radioactive material in transportation accidents can be represented as the product of the probability of an accidental release and the consequences of the release (DOT 1998). Radiological consequences of accidents are calculated by assigning package release fractions for each of a set of 6 accident severity categories. The release fraction is defined as the fraction of the radioactive material in the package that could be released from that package during an accident of a certain severity. The accident severity fractions and release fractions used in this analysis are based upon the 1987 Modal Study and the methods used to apply this information are more sophisticated than the methods used in NUREG-0170. For example, NUREG-0170 did not consider cask responses to accident forces and relied upon conservative engineering judgement to estimate releases.

Comparison to previous transportation risk studies. The above paragraphs describe the NRC staff's assessment of radiological impacts for PFS transportation as compared to those impacts under NUREG-0170 and, in some cases, the Modal Study. Additional transportation risk studies have been performed that are of some interest and/or relevance. One notable study was the basis of Table S-4 in 10 CFR 51.52, which was referenced by the applicant's environmental report. In this FEIS, however, the staff has formed its conclusions primarily based upon comparisons with NUREG-0170. The NRC staff believes that NUREG-0170 is a more applicable study in this instance than the study that was the basis for Table S-4, since the PFS shipment parameters differ from those assumed in Table S-4. As informational material, however, the following paragraphs compare results of Table S-4 in 10 CFR 51.52, NUREG-0170, and this FEIS.

Each of the generic studies and this FEIS utilize different assumptions and presentation of results. For example, Table S-4 presents risk in terms of population dose per reactor-year for all modes of transportation, and this FEIS presents dose on an annual basis of 200 rail shipments. A meaningful comparison of the results of these studies, for worker and public impacts, can be expressed in terms of dose per mile traveled, as follows.

Examination of WASH-1238 (pg. 8) reveals that the Table S-4 incident-free worker result of 4 man-rem-per-reactor-year consists of at least 2.65 person-rem-per-reactor-year attributable to rail shipment (including handlers at an ITF). Further, WASH-1238 (pg. 6) gives a basis for that result of

10,000 rail-miles-per-reactor-year. (Note that the value in the WASH-1238 table is 20,000 miles, but the footnote indicates that this includes the return of empty casks to the reactor). Dividing these values ($2.65/10,000$) yields a worker (including ITF handlers) dose of 2.6×10^{-4} person-rem-per-mile.

NUREG-0170 (pg. 4-46) estimates a 1985 incident-free worker (including handler) dose of 263.6 person-rem per year. The basis for this included 652 annual rail shipments of an average of 750 miles each, for a total shipment distance of 489,000 miles-per-year. Dividing these values ($263.6/489,000$) yields a worker (including ITF) dose of 5.4×10^{-4} person-rem-per-mile.

This FEIS for a proposed facility in Skull Valley (see Table 5-10) estimates an incident-free worker dose of 13.7 person-rem per year (which includes 11.9 person-rem for the ITF workers). This is based on 555,000 miles per year (200 casks per year times Maine Yankee to PFSF distance of 2775 miles). Dividing these values ($13.1/555,000$) yields a worker (including ITF) dose of 2.4×10^{-5} person-rem-per-mile.

Repeating the above calculation, but to obtain the incident-free public dose per mile, the results are: (1) Table S-4/WASH-1238, $0.3/10,000 = 3 \times 10^{-5}$ person-rem-per-mile; (2) NUREG-0170, $34.4/489,000 = 6.8 \times 10^{-4}$ person-rem-per-mile; and (3) PFS EIS, $9.41/555,000 = 1.7 \times 10^{-5}$ person-rem-per-mile.

As for accident risks, Table S-4 notes the risk from transportation accidents is “small” on a per-reactor-year basis. As shown in Table 5.7 of this FEIS, NUREG-0170 estimates a 1985 accident risk of 0.8 LCF per year, and the PFSF-specific RADTRAN4 analysis estimates an accident risk of 0.0025 LCF per year.

In March 2000, an NRC contractor report, NUREG/CR-6672, *Reexamination of Spent Fuel Shipment Risk Estimates*, was published. This report reexamined the risk associated with the transport of SNF. Cask and SNF response to collision impacts and fire were evaluated by performing three-dimensional, finite element (structural) and one-dimensional, heat transport calculations. Accident release fractions and accident severity fractions were developed to calculate the radiological risk (accident dose) from accidents. The accident dose risk was compared to dose risk calculated using NUREG-0170 and the Modal Study accident source terms. The reexamination demonstrates that both studies made a number of very conservative assumptions about SNF and cask response to accident conditions.

Based on the above information, the NRC staff concludes, for worker and public doses, that the transportation accident risk results for the proposed PFSF are a fraction of the results obtained from either NUREG-0170 or Table S-4/WASH-1238. In any event, however, even using the NUREG-0170 results, the transportation accident risks for radiological workers and the public are small. This supports the conclusion in FEIS Section 5.7.2.1.

5.7.2.4 Shipments to PFS: Nationwide Incident-Free Impacts

Because a small amount of radiation is emitted through the cask walls during incident free transportation, members of the public and transport workers along the route would receive a radiation dose from SNF shipments to the PFSF. This section quantifies these expected impacts.

Incident free assumptions. In determining incident-free impacts, the dose from each cask is assumed by the FEIS to be at the maximum value allowed by NRC regulations (note that these values are the maximum allowed for transportation packages in general, apply to millions of shipments per year, and are not specific to spent fuel casks). Specifically, each cask was conservatively assumed to have a dose rate of 0.13 mSv/hr at a distance of 1 m (13 mrem/hr at 3 ft) from the cask surface, which is equivalent to the regulatory limit of 0.1 mSv/hr at 2 m (10 mrem/hr at 6.5 ft). Further, for calculation of the incident-free dose, the source term was conservatively assumed to consist entirely of gamma radiation.

A representative route approach was used such that the NRC staff performed the analysis as if all 4000 casks of spent fuel to be stored at the proposed PFSF originated at the Maine Yankee nuclear power plant (even though the Maine Yankee plant itself would never have that much spent fuel to ship). This route is one of the longest possible routes that any individual shipment could experience, and also passes through some of the most populated regions of the country. Maximizing these factors tends to conservatively overestimate the transportation risks. Thus, the overall risks estimated using this route are expected to characterize risks of shipments to PFS, regardless of their individual origins, transportation details (such as use of intermodal transfer), and reasonably foreseeable route characteristics. Use of the representative route approach is further supported because the modes (viz., exclusively rail or intermodal including rail), routes, and companies that would ship spent fuel to PFS are subject to decisions that are yet to be made.

Incident-free results. Incident free doses were calculated for the general public, the train crew, and the Maximally Exposed Individual (MEI). The MEI was defined as an unshielded individual hypothetically positioned 30 m (98 ft) from the highway or railroad track with no intervening (shielding) objects, and the conveyance transporting the radioactive material considered in the analysis was modeled as passing by the MEI at a relatively slow speed of 24 km/hr (15 mph). This MEI was assumed to be present at this unshielded location for the entire inventory of shipments to the PFSF (200 shipments per year for 20 years). In contrast to the MEI doses (which represent the doses to a single hypothetical individual) that are presented and discussed in this FEIS, the doses to the general public include the combined doses to all members of the hypothetically exposed population and are therefore described in terms of person-Sv (person-rem).

Table 5.9 presents the doses for a one-year period and over the 20 year shipping campaign to transfer 4,000 SNF canisters to the proposed PFSF. Based on the analysis in this FEIS, the general public (approximately 1 million people) within 800 m (0.5 mile) of the rail route from a reactor site to the proposed PFSF would receive approximately 0.0918 person-Sv (9.18 person-rem) annually from the transport of 200 SNF casks to the PFSF. This would result in a public dose of 1.84 person-Sv (184 person-rem) over the 20-year campaign. The transportation crew (two people per shipment) would receive a dose of 0.0122 person-Sv (1.22 person-rem) annually, and 0.244 person-Sv (24.4 person-rem) over the 20-year campaign. (The transportation crews are not radiation workers, and their doses are governed by 49 CFR Part 173.) The MEI along this route would receive a dose of 1.1×10^{-6} Sv (1.1×10^{-4} rem or 0.11 mrem) annually, and 2.2×10^{-5} Sv (2.2×10^{-3} rem or 2.2 mrem) over the 20-year campaign.

Table 5.9. Incident free dose for SNF shipment from Maine Yankee to the proposed PFSF via rail

Dose [person-Sv (person-rem)]		RADTRAN MEI Dose [Sv (rem)]	Incident-free Risk (LCF)	
Transportation crew	Public		Transportation crew	Public
Annual—200 casks per year				
0.0122 (1.22)	0.0918 (9.18)	1.10×10^{-6} (1.10×10^{-4})	0.000488	0.00459
20-year campaign—4,000 casks				
0.244 (24.4)	1.84 (184)	2.2×10^{-5} (2.2×10^{-3})	0.00976	0.0918

Note: For an explanation of the numerical LCF values, please refer to the dialogue box in Section 5.7.2.

These numbers are considered conservative since each shipment was projected to travel a distance equivalent to that between the Maine Yankee reactor and the proposed PFSF, passing through significant population centers. Future U.S. population growth was accounted for by increasing population exposure by 30 percent, which would be approximately equivalent to making all shipments in the year 2020. Based on this analysis, over 1 million people would share 0.0918 person-Sv (9.18 person-rem) from incident-free SNF shipments to the PFSF. The corresponding LCF risks for the general public and the transportation crew are also presented in Table 5.9. The annual and 20-year campaign LCF risks for the MEI are 5.5×10^{-8} and 1.1×10^{-6} (or about one chance in 18 million and one chance in 1 million), respectively.

5.7.2.5 Shipments to PFS: Nationwide Transportation Accident Impacts

Accident assumptions. In assessing transportation accident risk, the NRC considers both the probability and the consequences of possible transportation accidents. The probability term is obtained by multiplying the chance of any accident per unit distance, by the fraction of accidents that are severe enough to challenge a cask, and the total distance to be traveled. The accident rates used in this analysis are the same as those in the 1987 Modal Study. The railcar accident rate was 0.11 accidents per million railcar kilometers traveled. This value was based on accident data collected by the Federal Railroad Administration. Only a very severe accident could damage a spent fuel cask. The set of all possible accidents was further divided into six accident severity categories of increasing severity. Data from the Modal Study was used to define these six categories, and identify the fraction of accidents severe enough to challenge a cask. The details of this technique are given in Appendix D. The total distance traveled was determined using the INTERLINE code (see Appendix C) for the representative route from Maine Yankee to PFSF; all 4000 casks were assumed to originate from Maine Yankee.

A major factor in determining the consequences of an accident is the amount or fraction of radioactive material released during an accident. This is represented in RADTRAN by release fractions, which are defined for each of the six accident categories. The release fractions used in this assessment are

from the 1987 Modal Study. Appendix D provides details on the release fractions that were used. To transport 200 casks per year, PFS has indicated that on average there would be 50 rail shipments carrying four casks each. With four casks per shipment, the amount of material released is dependent on the response of each cask to a given accident. In the incident free assessment, 200 annual shipments of one cask each were used to calculate dose risk because the mathematical result from RADTRAN4 would be the same as 50 shipments of 4 casks each; but a similar approach cannot be used for the accident assessment, because the dose risk at a given point on the route would be greatest if all 4 casks on a given shipment were damaged and released material in the accident. In this analysis it was assumed each of the four casks was damaged and released material to the same extent; this provides an upper bound to the results of the accident scenario.

Accident results. For all rail shipments to the proposed PFSF, the accident dose risk was estimated to be 0.0423 person-Sv (4.23 person-rem) annually and 0.84 person-Sv (84.6 person-rem) for the entire 20-year campaign. This equates to an accident dose risk of 0.00085 person-Sv (0.085 person-rem) per shipment. The LCF risks for the annual and 20-year campaign calculated exposures are 0.00212 and 0.042, respectively.

The four casks (including impact limiters) are widely separated from each other on the train, and are unlikely to experience the same forces in an accident. It would be reasonable to expect that in an accident, all four casks would not be damaged to the extent that each one would release material and provide a source of radiation exposure to the public. If only one of the four casks were damaged to the extent radiological material was released, the dose risks to the public as presented in the preceding paragraph would be further reduced by a factor of about 3.58, resulting in a risk of 0.0118 person-Sv (1.18 person-rem) annually and 0.24 person-Sv (24 person-rem) for the entire 20-year campaign. This equates to an accident dose risk of 0.000236 person-Sv (0.0236 person-rem) per shipment. The NRC staff believes a reasonable estimate of the risk is somewhere between the two estimates but closer to the estimate for the release from a single cask. In any event, the radiological risk from an accident during the rail transport of SNF is small.

Economic consequences. Transportation accidents resulting in a release of radioactive material would have economic costs. Accidents resulting from transportation of spent nuclear fuel from reactor sites to the proposed PFSF are covered under the Price Anderson Act. One of the objectives of the Price Anderson Act is to ensure that adequate funds are available to the public to satisfy liability claims if an accident occurs. The NRC has specific indemnity and insurance requirements for the transport of spent nuclear fuel to and from reactor sites. As a result of the Act, the nuclear power industry is insured to a maximum per incident dollar level of \$9.1 billion. The Act is now structured such the entire \$9.1 billion would come from private sources. Furthermore, Congress enacted legislation in 1988 that developed a method to promptly consider compensation claims of the public for liabilities resulting from nuclear accidents that exceed the \$9.1 billion limit (NRC 1998a).

The NRC staff believes it is unlikely that the economic impact of a transportation accident would exceed the amount of coverage provided under the Act because only a small fraction of accidents would result in a release of radioactive material. Based upon the Modal Study analyses, the NRC staff estimates that 99.4 percent of potential rail transportation accidents would not result in a release of radioactive material, and 99.98 percent would not result in a release that exceeds the allowable limits in 10 CFR Part 71 (NUREG/CR-4829). Only a small fraction of the remaining 0.02 percent of rail transportation accidents would result in a significant release of radioactive material. Accidents that would result in a significant release of radioactivity are considered to be unlikely.

An attempt to calculate the economic costs of these unlikely accidents with any precision is speculative and difficult. The methods available to calculate the economic cost are dependent upon several uncertain variables and the calculated cost can vary significantly depending upon the location and conditions of the accident. Some of the key variables include spread of contamination, including contamination dispersion and deposition; level of development; land use (including human consumption of fruits and vegetables grown on the land as well as grains, milk, and meat from sources within the area of the accident); and cleanup standards. Because of the uncertainty in the variables, results of these methods can only be considered speculative and uncertain. A quantitative estimate of cost would require the NRC to speculate on many key variables, one of which would be the location of the accident. Therefore, the NRC staff has not attempted to quantify the economic cost of any particular accident in the FEIS. Nevertheless, the NRC staff believes that for the majority of accidents, members of the public would incur little to no economic cost, whereas an extremely small fraction of accidents could have significant economic costs.

Emergency response. Emergency responders are trained to establish an exclusion area around any potentially harmful accident involving any hazardous material and to ensure that appropriate actions are taken to limit the impact of accidents. Carriers and shippers are required to prepare emergency response plans and provide assistance and information to emergency responders under ANSI N14.27-1986(R1993). The DOT, together with its counterparts in Canada and Mexico, published the "2000 Emergency Response Guidebook," (ERG2000) for carriers and State and local first-responders to use during the initial phase of an accident involving hazardous materials. The ERG2000 sections that apply to spent fuel include instructions on controlling spills and leaks. Also, driver training is required by DOT, including crew training for emergency situations and contacting and assisting first responders.

States are recognized as responsible for protecting public health and safety during radiological transportation accidents. Federal agencies are prepared to monitor transportation accidents, and provide assistance if requested by states to do so. Eight federal Regional Coordinating Offices, funded by the DOE, are maintained throughout the U.S. Personnel in these offices are on 24-hour call, and are capable of responding to such emergencies with equipment and experts that could advise on recovery and removal of the cask and site remediation. Because (1) nationwide, there are millions of shipments of radioactive material each year, for which the states already provide capable emergency response and (2) States can also obtain timely Federal-level emergency response assistance when necessary, the NRC staff concludes that significant additional cost would not be incurred, related to unique or different training to respond to potential transportation accidents involving spent fuel as compared to existing radioactive materials commerce.

5.7.2.6 Incident-Free and Accident Impacts of Intermodal Operations Near Reactor Sites

Some NRC-licensed reactors do not have direct rail access and are expected to transfer the spent fuel casks by barge or heavy haul truck (HHT) a short distance (relative to the overall route length) to the nearest rail-head for loading onto railcars. The shipment would continue from that location to Skull Valley via dedicated train. This section considers whether the use of the representative Maine Yankee-to-PFSF route is appropriate in light of these practices.

The representative route from Maine Yankee to PFSF is intended to characterize risks of shipments to PFS, regardless of their individual origins, transportation details (such as use of intermodal transfer), and reasonably foreseeable route characteristics. Therefore, the specifics of which reactors would

utilize an intermodal option are not material to the FEIS conclusions. To ensure that the incident-free and accident impacts of such activities are reflected by the Maine Yankee-to-PFSF representative route, the NRC staff has reviewed two example cases involving the St. Lucie nuclear plant and Salem nuclear plant. The details of these assessments are found in Appendix D.

The incident-free radiological impacts of such activities include the dose to the crew and public during the HHT or barge movement, and the dose to workers and handlers while transferring the cask at the rail head. It is assumed that the doses to the public at the intermodal transfer point are negligible (due to a significant separation distance).

The accident impacts include the possible accidents that might occur during the HHT or barge transportation segment. Accidents at the intermodal transfer point itself could not reasonably be expected to be more challenging to casks than the 10 CFR Part 71 certification standards; therefore accidents at the intermodal transfer point leading to release are considered remote and speculative events.

The examination of the intermodal transfer near reactors (in Appendix D) concludes that the incident free and accident impacts *of an individual shipment* could exceed the incident free and accident impacts of the representative Maine Yankee-to-PFSF route. However, when one considers that this FEIS treats the entire inventory of shipments as traveling from Maine Yankee to PFSF, and only a small fraction of the inventory could travel from any given site, the overall (nationwide) transportation risk impacts for the entire action are bounded by the Maine Yankee-to-PFSF results presented in this FEIS. Indeed, based on reactor locations and rail access, most routes to PFSF would have lower risks than the Maine Yankee-to-PFSF route; some routes could have higher risks. Overall, the NRC staff finds that the Maine Yankee-to-PFSF route conservatively represents the nationwide risks of the proposed action.

5.7.2.7 Shipments from PFS: Incident-Free and Accident Impacts

This section examines the radiological risk of transporting all 4,000 SNF canisters from the proposed PFSF to the Utah-Nevada border. The SNF would remain at the proposed PFSF for a number of years, after which it would be removed and transported to a final repository. The NRC staff performed an additional assessment of shipment of SNF from the proposed PFSF to a permanent repository. Congress, in the Nuclear Waste Policy Act (NWPA), as amended, had directed the DOE to study one candidate repository, namely a repository proposed at Yucca Mountain, Nevada. To reflect the provisions of the NWPA, the NRC staff has examined the shipment of SNF via rail from the proposed PFSF on its way to a permanent repository in the western United States as if such a repository were located at Yucca Mountain, Nevada, although that location may or may not become the actual repository. Accordingly the NRC staff examined the shipment of SNF via rail from the proposed PFSF through Black Rock, Utah, to the Utah-Nevada border. It should be noted that the NRC has not received an application requesting a license for permanent geologic repository, and the NRC has not made any determination regarding any proposal to construct such a repository at Yucca Mountain, Nevada, or any other location. DOE is not currently considering any other location. However, the NRC staff recognized that Yucca Mountain may not be selected or approved as the final repository, but the assumption made is for analytical purposes in this FEIS. Further, this EIS does not dictate any particular result for future actions taken with respect to other nuclear waste management facilities (including a repository or other storage facility).

The plans beyond the Utah border are subject to decisions that have not yet been made. However, the NRC staff believes it is reasonable to assume that the impacts of future transportation to a repository would be encompassed by the impacts of the representative Maine Yankee-to-PFS route (considering factors such as distance, routing, and radioactivity). Accordingly, the specifics and details of potential repository location, design, and operations (e.g., use of a direct rail route or an intermodal facility with heavy haul segment) that are not yet certain are not included in the assessments and conclusions in this FEIS.

For the purposes of analysis, it was assumed that the SNF in the canisters would have been cooled at least 20 years prior to shipment to a repository. It was also assumed that the shipping casks designed to bring the canisters to the PFSF would be used to ship them to a repository. These assumptions are judged reasonable because this will (1) save the cost of designing, certifying, and fabricating new casks, (2) reduce potential handling activities, and (3) reduce the dose rate from the casks because of the decay of many of the isotopes that would be inside the canisters. Comparing 5-year-old fuel with 20-year-old fuel with the same burn-up, the radioactivity of the most significant isotopes will be reduced by a factor of two. To a first approximation, the dose rate is assumed to be reduced by this same ratio, i.e., to 0.065 mSv/hr (6.5 mrem/hr) at a distance of 1 m (3.3 ft) from the cask surface. However, the population of Utah is expected to increase about a factor of two from 1990 (at 1.72 million) to 2040 (projected to be 3.38 million).

The net result of reducing the external dose rate from the packages and increasing the population is presented in Table 5.10 for a one-year campaign of transporting 200 casks and the 20-year campaign to remove all 4,000 casks by rail using the Skunk Ridge route. The table shows that the incident-free public risk estimate exceeds the accident risk estimate, as explained in Section 5.7.2.1. The incident-free dose to the MEI for the shipping campaign from PFSF to the Utah-Nevada border (see Section 5.7.2.4) along the route would be 5.5×10^{-7} Sv (5.5×10^{-5} rem) annually, and 1.1×10^{-5} Sv (1.1×10^{-3} rem) for the 20-year campaign.

Table 5.10. Annual and cumulative 20-year campaign radiation doses associated with SNF shipment from the proposed PFSF to the Utah-Nevada border via rail

Incident-free dose [person-Sv (person-rem)]		MEI dose [person-Sv (person-rem)]	Accident dose risk to public [person-Sv (person-rem)]
Transportation crew	Public		
Annual—200 casks per year			
0.00218 (0.218)	8.0×10^{-4} (0.080)	5.5×10^{-7} (5.5×10^{-5})	2.23×10^{-4} (0.0223)
20-year campaign—4,000 casks			
0.0436 (4.36)	0.0160 (1.60)	1.1×10^{-5} (1.1×10^{-3})	4.46×10^{-3} (0.446)

For the ITF alternative, the SNF would be shipped in the same type of casks in which the fuel was originally delivered to the proposed PFSF (for the reasons given above for the all-rail shipment scenario), and the first leg of the journey would be by heavy haul truck from the proposed PFSF to the

ITF at the Timpie rail siding. The SNF would then be loaded on a Union Pacific train for the rail portion of the trip. As described above, the fuel would have been cooled for an additional period while at PFSF. Assuming a 20-year period at the PFSF, its external dose rate would have decreased by about a factor of two prior to shipment from PFSF. Accordingly, the dose to workers who handle the casks directly, such as those who work at the ITF, would be about a factor of two less than the doses estimated for the incoming cask transfers at the ITF.

The last leg of this intermodal transportation scenario in Utah would be by train. The casks would be placed on a train, and for consistency, it is assumed that each train would handle four casks. Because the final route and mode of transportation are unknown at this time, this analysis assumes the SNF would be hauled to the Utah-Nevada border as discussed above. A summary of the radiation dose results is given in Table 5.11. Note that the dose received by the transport crew in the intermodal shipment (Table 5.11) is higher than for the crew when the shipment is entirely by rail (Table 5.10). Approximately 90 percent of the crew's dose when using the ITF is a result of transferring each cask from a heavy-haul truck to a railcar. There is also a slight increase in the dose received by the general population, primarily from the population exposure during the truck shipping phase. The incident-free dose to the MEI (see Section 5.7.2.4) along the route would be 5.5×10^{-7} Sv (5.5×10^{-5} rem) annually, and 1.1×10^{-5} Sv (1.1×10^{-3} rem) for the 20-year campaign.

Table 5.11. Annual and cumulative 20-year campaign radiation doses associated with intermodal SNF shipment from the PFSF to the Utah-Nevada border via an ITF near Timpie, Utah

Incident-free dose [person-Sv (person-rem)]		MEI dose [person-Sv (person-rem)]	Accident dose risk to public [person-Sv (person-rem)]
Transportation crew	Public		
Annual—200 casks per year			
0.0669 (6.69)	0.00232 (0.232)	5.5×10^{-6} (5.5×10^{-4})	2.34×10^{-4} (0.0234)
20-year campaign—4,000 casks			
1.34 (134)	0.0464 (4.64)	1.1×10^{-5} (1.1×10^{-3})	4.68×10^{-3} (0.468)

Tables 5.12 and 5.13 show the risks (as measured by LCFs) of the campaigns to remove SNF from the proposed PFSF and send it to the Utah-Nevada border. The incident-free risk to the MEI (see Section 5.7.2.4) along either the all-rail route or the ITF route would be 2.75×10^{-8} annually, and 5.5×10^{-7} for the 20-year campaign.

Table 5.12. Annual and cumulative 20-year campaign health risks associated with SNF shipment from the proposed PFSF to the Utah-Nevada border via rail^{a,b}

Incident-free risk (LCF) ^c			
Transportation crew	Public	MEI risk (LCF)	Accident risk to public (LCF)
Annual—200 casks per year			
8.72×10^{-5}	4.00×10^{-5}	2.75×10^{-8}	1.12×10^{-5}
20-year campaign—4,000 casks			
1.74×10^{-3}	8.00×10^{-4}	5.5×10^{-7}	2.23×10^{-4}

^aEach train would carry four casks and travel 570 km (354 miles) to the Utah-Nevada border.

^bThe number of LCFs presented here may be compared to the national average lifetime risk of death from cancer from all causes, which is approximately 0.25 (about 1 in 4).

^cThe crew size would be two persons for rail transport.

Note: For an explanation of the numerical LCF values, please refer to the dialogue box in Section 5.7.2

Table 5.13. Annual and cumulative 20-year campaign health risks associated with intermodal SNF shipment from the proposed PFSF to the Utah-Nevada border via an ITF near Timpie, Utah

Incident-free risk (LCF)			
Transportation crew	Public	MEI risk (LCF)	Accident risk to public (LCF)
Annual—200 casks per year			
2.68×10^{-3}	1.16×10^{-4}	2.75×10^{-8}	1.17×10^{-5}
20-year campaign—4,000 casks			
5.35×10^{-2}	2.32×10^{-3}	5.55×10^{-7}	2.34×10^{-4}

Note: For an explanation of the numerical LCF values, please refer to the dialogue box in Section 5.7.2

5.7.2.8 Utah and Regional Impacts

The impacts of transporting SNF in the region (i.e., considered to be in and near the state of Utah) were also analyzed in detail. To analyze the regional impacts, rail access routes and route lengths were selected to cross the Utah state borders, where possible, and to accommodate convergence points from rail lines farther away from the proposed PFSF. Five different access routes (see Figure 2.7) potentially could be used to reach the proposed site in Skull Valley, Utah. The actual

distance of the identified routes varies from 330 km (220 miles) to 385 km (239 miles) due to the structure of the INTERLINE rail routing network. The characteristics of each of the five routes are described in Appendix C. It is not likely that any one route would be used to transport all 40,000 MTU. However, to present an upper bound of these impacts, each route was analyzed assuming that it was used to transport all 40,000 MTU. The radiological impacts from incident-free transportation and transportation accidents are found in Appendix D and are summarized below.

For SNF shipments to the proposed PFSF the largest incident-free dose to the public would be associated with the route to Skull Valley from Green River, Utah. The estimated annual dose to the public would be 0.00619 person-Sv (0.619 person-rem). This dose corresponds to an LCF of 3.1×10^{-4} .

For a rail accident along the Green River route, the annual dose to the public would be 0.0022 person-Sv (0.222 person-rem). This dose would produce an annual LCF of 1.11×10^{-4} .

If the ITF is constructed instead of the rail line from Skunk Ridge, the route from Green River would provide the largest incident-free doses to the public. The combined annual dose to the public for SNF shipments to the Timpie siding (from Green River) and heavy-haul along Skull Valley Road would be 0.0083 person-Sv (0.83 person-rem).

5.7.2.9 Timpie, Utah, Intermodal Transfer Facility Option: Incident-Free and Accident Impacts

In addition to construction of a new connecting rail line from Skunk Ridge to PFS, an alternative is being considered that would use the Timpie siding on the Union Pacific Railroad as an intermodal transfer facility (ITF). This section describes the radiological impacts to members of the public and to workers associated with such intermodal operations. The term, 'Intermodal operations' includes both transferring the transportation cask to a heavy-haul truck (HHT) and movement of that truck southward on Skull Valley Road to PFSF. Both the accident and incident-free risks of these activities are discussed.

Incident-free doses. If the new rail line is not built from Skunk Ridge, the Timpie siding on the Union Pacific rail line would be the location at which an ITF would be built. The ITF is the facility at which the transfer of SNF shipping casks from rail to truck would take place. Transportation of SNF to the proposed PFSF via an ITF near Timpie can be divided into three major phases. The first phase is to transport SNF from the reactor site to the ITF near Timpie. PFS has indicated that the cross country portion of this phase would take place using rail only. The second phase is to transfer the SNF from a railcar to a heavy-haul vehicle at the ITF. Finally, the SNF would be transported southward on Skull Valley Road using the heavy-haul vehicle to the proposed PFSF.

Table 5.14 provides estimates of the annual and 20-year campaign incident-free doses to the transportation crew and the general public for the ITF alternative. The incident-free dose to the MEI (see Section 5.7.2.4) would be 1.1×10^{-6} Sv (1.1×10^{-4} rem) annually and 2.2×10^{-5} Sv (2.2×10^{-3} rem) for the 20-year campaign. In general, comparing Tables 5.9 and 5.14, the ITF alternative results in additional worker impacts due to greater handling, but has very little effect on the impacts to the general public. Table 5.14 also presents the LCF risks to the crew and general public from exposure to the annual and 20-year campaign doses. The LCF risks to the MEI from exposure to the annual and 20-year campaign doses are 5.5×10^{-8} and 1.1×10^{-6} (or about one chance in 18 million of developing a fatal cancer from one year of operation and one chance in 1 million of

developing a fatal cancer from 20 years of operation), respectively. The summary below describes how each phase of the transportation contributes to the totals displayed in Table 5.14.

Table 5.14. Incident free dose for SNF shipment from Maine Yankee to the proposed PFSF via an ITF near Timpie, Utah

Dose [person-Sv (person-rem)]		MEI dose [person-Sv (person-rem)]	Incident-free risk (LCF)	
Transportation crew	Public		Transportation crew	Public
Annual—200 casks per year				
0.136 (13.6)	0.0942 (9.42)	1.1×10^{-6} (1.1×10^{-4})	0.0054	0.0047
20-year campaign—4,000 casks				
2.72 (272)	1.88 (188)	2.2×10^{-5} (2.2×10^{-3})	0.108	0.094

Note: For an explanation of the numerical LCF values, please refer to the dialogue box in Section 5.7.2.

Shipments from the reactor sites to the ITF. The shipment of casks to the ITF generates almost identical doses to the transportation workers and the public at large as did the shipments moving all the way to the PFSF via the proposed Skunk Ridge rail line. This is because the distance from Maine Yankee to the ITF [4,431 km (2,747 miles)] is only slightly less than the distance from Maine Yankee to the proposed PFSF [4,476 km (2,775 miles)]. Table 5.15 presents the projected dose received by the train crew and the population for the shipments to the ITF at the Timpie siding. The incident-free dose to the MEI (see Section 5.7.2.4) along this route would be 1.1×10^{-6} Sv (1.1×10^{-4} rem) annually and 2.2×10^{-5} Sv (2.2×10^{-3} rem) for the 20-year campaign.

Table 5.15. Incident free dose for SNF shipment from Maine Yankee to the ITF via rail

Dose [person-Sv (person-rem)]		MEI dose [person-Sv (person-rem)]	Incident-free risk (LCF)	
Transportation crew	Public		Transportation crew	Public
Annual—200 casks per year				
0.0121 (1.21)	0.0917 (9.17)	1.1×10^{-6} (1.1×10^{-4})	0.000484	0.00459
20-year campaign—4,000 casks				
0.242 (24.2)	1.83 (183)	2.2×10^{-5} (2.2×10^{-3})	0.00968	0.0915

Note: For an explanation of the numerical LCF values, please refer to the dialogue box in Section 5.7.2.

SNF transfer at the ITF. Once the fuel is received at the ITF, the cask transfer activities that are expected to take place at that facility include radiation monitoring, release of the package tie-downs from the railcar, hoisting the cask off of the railcar with a crane and moving it to the heavy-haul trailer, and re-securing the cask to the trailer. The remaining casks would be held on the railcars until the heavy-haul trailer and its escort returns to pick up each of the remaining casks.

At the ITF the crew would consist of four handlers and a spotter, an inspector, a crane operator and a health physics staff member. These workers would be employees of PFS and are the same workers that would be involved in unloading the cask and inspection (i.e., Type 1 and Type 2 workers) and maintenance at the proposed PFSF (see Section 4.7). The handlers would attach ropes to the ends of the cask after it is released from the railcar and help guide it into a tie-down cradle on the low-boy trailer or to the temporary storage location. The spotter would give directions to the crane operator and the handlers. The inspector would ensure that all written procedures are followed. The health physics staff would monitor the movement and check the cask external surface for levels of radiation and contamination.

The assumptions and method for estimating the dose received by the ITF crew are based on an analysis of an intermodal transfer of SNF shipping casks (Neuhauser and Weiner 1992). The analysis categorized the tasks of a SNF transfer crew and estimated the time and distance from the cask to the positions taken by crew members to make the transfer. Using similar exposure times, the total dose received by the eight ITF crew members is estimated to be 0.119 person-Sv/yr (11.9 person-rem/yr), or 2.38 person-Sv (238 person-rem) over the entire 20-year campaign of shipping SNF to Skull Valley. Details of this analysis are presented in Appendix D.

The dose to members of the public during the time that casks are at the ITF awaiting transfer to the PFSF is assumed to be negligible. This is because of the remoteness of the ITF and its access restrictions. Worker dose is dependent upon the distance between casks and workers, duration of exposures, and the presence of intervening shielding. The primary source of exposure would come from the cask being moved between transportation modes. Although doses at the ITF are not regulated by NRC under Part 72, the NRC staff assumed that worker dose would be controlled by a radiation protection program, and unnecessary dose would be further controlled insofar as PFS would need to satisfy requirements to implement ALARA (as low as is reasonably achievable) concepts in its operating practices. The NRC inspection program would review PFSF site records to assure that Part 20 worker dose standards are not exceeded by radiation workers.

Truck shipments via Skull Valley Road. Use of an ITF located near Timpie would require that SNF casks be shipped the last 41 km (26 miles) to the proposed PFSF by heavy-haul vehicle. A rail siding and cask handling equipment would be available at the ITF site. Assuming the PFSF receives 200 casks per year, the ITF would transfer, on the average, four casks each week, and these casks are likely to come in on 1 to 2 trains for each 7-day period. As compared to the direct rail option that nominally assumes trains averaging 4 casks each, the ITF could handle a maximum of 3 casks per single purpose train. To achieve the desired receipt rate of 4 casks per week, 2 equivalent incoming trains per week carrying 2 casks would be required. (Note that the nationwide radiological impacts are the same in either case, because each cask was assumed to be a separate radiation source independent of the train length, and the dose from one cask was multiplied by 200 to get the annual impact). It is anticipated that for the maximum train size of 3 loaded cask cars, it would take approximately 28 work hours to complete the transfer of the last cask to the heavy haul truck for delivery to PFSF. One of the casks would be transferred from its railcar onto a heavy-haul truck (see

Figure 2.8). The other casks would remain on the railcars until the heavy-haul truck returned from the PFSF, whereupon they would be transferred to the HHT, one at a time, and the shipping sequence would be repeated.

Shipments from the ITF to the proposed PFSF would be made only during daylight hours. Each truck shipment to the PFSF would be accompanied by escorts: one vehicle in front and one at the rear of the heavy-haul tractor/trailer in accordance with Utah Department of Transportation Regulations for Legal and Permitted Vehicles, Section 600. The heavy-haul vehicle is expected to travel at a speed of about 32 km/hr (20 mph) over the 41 km (26-mile) road to the PFSF. The trip will take approximately 1.5 hours. It is anticipated that the two pilot/escort vehicles will travel up to 300 m (1,000 ft) ahead of and behind the heavy-haul vehicle to warn travelers of the slow moving truck. Once unloaded, the heavy-haul vehicle and escorts can return to the ITF and pick up the next cask. RADTRAN4 was used to estimate the doses to the workers involved with transporting the SNF from the ITF to the proposed PFSF. Dose calculations for these intermodal shipments are discussed below and the exposure data are presented in Table 5.16.

Table 5.16. Incident free doses for SNF shipment from the ITF to the PFSF via heavy-haul vehicle

HHT crew dose ^a [person-Sv (person-rem)]	Population dose ^b [person-Sv (person-rem)]	MEI dose [person-Sv (person-rem)]	Risk (LCF)	
			HHT crew	Public
Annual dose, 200 casks per year ^c				
0.00524 (0.524)	0.00254 (0.254)	1.1 × 10 ⁻⁶ (1.1 × 10 ⁻⁴)	0.00021	0.000127
20-year life campaign - 4,000 casks ^c				
0.105 (10.5)	0.0508 (5.08)	2.2 × 10 ⁻⁵ (2.2 × 10 ⁻³)	0.0042	0.0025

^aAssumes one driver and a dose rate of 0.02 mSv/hr (2.0 mrem/hr) in the cab; also includes exposure to four escorts

^bThe population doses have been increased by 61 percent to account for projected population increases in Utah between 1990 and 2020.

^cAssumes 1 cask per low-boy shipment transported 41.8 km (26 miles).

Note: For an explanation of the numerical LCF values, please refer to the dialogue box in Section. 5.7.2.

Assuming there would be one driver in the truck and the dose rate in the cab is at the maximum U.S. DOT limit of 0.02 mSv/hr (2 mrem/hr), the dose to the driver would not exceed 0.03 mSv (3 mrem) for each trip. PFS could provide some small amount of additional radiation shielding for the driver, which would reduce the driver's dose to a fraction of this amount. The PFSF driver(s) would make 200 such shipments each year. Conservatively assuming that one driver and four escorts make all of these trips, the total accumulated dose to the driver of the HHT would not exceed:

$$(200 \text{ shipments/yr}) \cdot (0.03 \text{ mSv/shipment}) = 6 \text{ mSv/yr (600 mrem/yr)}.$$

This translates to a maximum cumulative dose of 0.105 person-Sv (10.5 person-rem) for a 20-year campaign.

If the escorts drive an average of 240 m (800 ft) in front of and behind the shipping cask on the heavy-haul trailer, the dose rate in their vehicles, assuming no intermediate shielding such as the body of the vehicles they are riding in or the cab of the heavy haul truck, should not exceed 2×10^{-6} mSv/hr (0.0002 mrem/hr) (see Figure D.1 in Appendix D of this EIS). If there are two escorts in each vehicle, the four escorts would receive:

$$(200 \text{ shipments/yr}) \cdot (4 \text{ escorts/shipment}) \cdot (2 \times 10^{-6} \text{ mSv/hr per person}) \cdot (1.5 \text{ hr/shipment}) = 0.0024 \text{ person-mSv/yr (0.24 person-mrem/yr).}$$

This translates to a maximum cumulative dose of 0.048 person-mSv (4.8 person-mrem) to the escorts for the 20-year campaign.

Information from Tables 5.15 and 5.16 has been combined with the total dose received by the ITF and local transportation crew and is presented in Table 5.14. Table 5.14 summarizes the total dose both to the working crews and the population if the ITF were used to transport SNF to the proposed PFSF. By comparing Table 5.9 with Table 5.14 it is apparent that when SNF is shipped using the ITF, the dose to the crew increases about a factor of 11 over the 20-year shipping campaign [compare 0.244 person-Sv (24.4 person-rem) with 2.73 person-Sv (273 person-rem)]. However, intermodal shipments have only a minor effect on the dose received by the population in general [1.84 person-Sv (184 person-rem) using the Skunk Ridge rail line vs. 1.88 person-Sv (188 person-rem) using the ITF] because most of the exposure to the public occurs on the cross-country rail portion of the shipment which is almost the same whether the rail shipment stops at Timpie or is carried all the way to the PFSF.

Accidents. Accident dose risk for the transport of SNF from operating reactors to the proposed PFSF via the ITF would be similar to the accident dose risk discussed above for the shipments via the Skunk Ridge rail line because the largest contributor to the risk is associated with the cross-country shipment of SNF from the reactor sites to the ITF. Accidents associated with the transfer operations at the ITF (i.e., removing the cask from the railcar and placing it onto a HHT), are considered by this assessment to have a negligible contribution to accident risk. (For example, the maximum expected drop height at the ITF would be less severe than the 10 CFR Part 71 cask design requirements). Accident dose risk is also calculated for the transport of SNF southward on Skull Valley Road by HHT to the PFSF. Using RADTRAN4, the accident dose risk from shipments southward on Skull Valley Road was determined to be 1.08×10^{-5} person-Sv (0.00108 person-rem) annually. For the 20-year campaign, this dose risk would be 0.00022 person-Sv (0.022 person-rem). This is equivalent to an LCF of 1.1×10^{-5} or about one chance in 93,000 that any individual exposed along Skull Valley Road would develop a fatal cancer from this level of exposure. These dose risk estimates reflect the expected increase in the Utah population from 1990 to 2020.

ITF option conclusion. In summary, the above analysis predicts that the Timpie ITF option represents a moderate increase in worker dose and a small increase in dose risk to members of the public, as compared to the new rail line option. This dose risk increase is primarily associated with increased cask handling during incident-free operations. As stated earlier in this section, such activities would be conducted by PFS under a radiation protection program. Overall, the impacts of either the ITF or rail line option are small.

5.7.2.10 Sabotage in Transportation

The current requirement contained in 10 CFR 73.37 for safeguarding shipments from acts of sabotage was promulgated in 1980 (see the dialogue box below). The requirements were based on analytical studies that estimated the consequences from credible sabotage events. Since sabotage is a deliberate malevolent act, a meaningful probability of likelihood cannot be assigned. Therefore, analyses of sabotage focus on the consequences of such an event.

The extensive security measures required by NRC regulations minimize the likelihood of radiological sabotage events. Moreover, the casks required to be used to transport SNF are designed to withstand very substantial impacts during transport without loss of containment integrity. The cask designs should further reduce the likelihood of release of radioactive material in the extremely unlikely event of sabotage. In view of the above, if a sabotage event were to occur, it is the judgement of the NRC staff that the consequences would not be unacceptably large.

PERFORMANCE OBJECTIVES FOR SNF PHYSICAL PROTECTION REQUIREMENTS

- (1) minimize the possibilities of radiological sabotage of SNF shipments, especially within heavily populated areas; and
- (2) facilitate the location and recovery of SNF shipments that may have come under the control of unauthorized persons.

To achieve these objectives, the physical protection shall:

- (1) provide for early detection and assessment of attempts by unauthorized parties to gain access or control over SNF shipments,
- (2) provide for notification to the appropriate authorities of any attempt to sabotage a SNF shipment, and
- (3) impede attempts of radiological sabotage of SNF within heavily populated areas, or attempts to illicitly move SNF shipments into heavily populated areas until response forces arrive.

To achieve these objectives, detailed requirements are set forth in NRC regulations for physical protection plans to be established and maintained by NRC licensees.

5.7.2.11 Conclusions

Because the analyses performed for this FEIS used consistently conservative assumptions, the NRC staff has confidence that the actual transportation risks associated with the proposed PFSF will not be higher than those reported here. Based on the foregoing, the staff finds that annual and cumulative radiological impacts of transporting SNF to the proposed PFSF are small. Also, the analytical results for transportation of SNF to and from the proposed PFSF are consistent with earlier analyses of SNF risks reported in NUREG-0170.

5.7.3 Mitigation Measures

The human health impacts from transportation of SNF would be small and, therefore, consideration of additional mitigation measures (i.e., beyond those required by existing regulations or incorporated into the design of the shipping casks) is not warranted.

5.8 Other Impacts

5.8.1 Noise

5.8.1.1 Construction Impacts

Noise impacts would result from construction of a rail line or an ITF. Construction, excavation, and earthwork activities can generate noise levels up to 95 dB (EPA 1974, 1978) in the frequency range of human hearing [dB(A)]. This noise level applies at a reference distance of 15 m (50 ft) from the source. Noise levels decrease by about 6 dB(A) for each doubling of distance from the source, although further reduction occurs when the sound energy has traveled far enough to have been appreciably reduced by absorption into the atmosphere. Absorption depends strongly on the frequency of the sound. Typical absorption of low-frequency construction-related sounds is about 1 dB(A) per km (1 dB per 0.6 mile) (Campanella 1992).

Construction of a new rail line could generate daytime noise levels of up to 95 dB(A) [at 15 m (50 ft) from the source for brief periods. At distances greater than about 4 km (2.5 miles), expected maximum noise levels from construction would be less than the 45 dB(A) recommended by EPA (1978) for protection against indoor activity interference and annoyance. Because of the remote location of the rail line, people other than construction workers are not likely to be within 4 km (2.5 miles) of those construction activities. When such activities would occur near Interstate 80 (such as for the Skunk Ridge rail siding or the ITF, they would not produce much additional noise for automobile passengers, as is verifiable from experience traveling near construction areas along major highways. For vehicle passengers traveling along Interstate 80, this noise would be difficult to distinguish from the background traffic noise [typically around 75 dB(A) for an automobile passenger (EPA 1978)] at distances of 200 m (650 ft) or more from the construction

5.8.1.2 Impacts During Operations

The loudest potential noise source associated with the operation of a delivery locomotive would be the train whistle. These whistles must be loud for safety reasons, and can reach levels of 110 dB(A) at 15 m (50 ft). Train whistles are often audible at distances greater than 1.6 km (1 mile) during daytime hours, and would be audible at even greater distances where background levels are as low as in Skull Valley. However, at distances greater than 1 km, the absorption of sound energy by the atmosphere is no longer negligible, and noise decreases by more than 6 dB(A) for each doubling of distance from the source, especially in the higher frequencies corresponding to a whistle (Campanella 1992). Further, any train whistles that may sound (e.g., at grade crossings) would be in a sufficiently remote area that people other than transportation personnel would not be likely to be close enough to hear it.

Routine locomotive operation would only occur during brief periods when transfer or movement of a shipping cask is taking place. Further, the trains involved would be moving slowly and would not be hauling boxcars; therefore, their noise level would not be as great as a typical train [95 dB(A)], but would be closer to the 85 dB(A) level expected for a heavy-haul truck transporting a cask to the site.

Because of the remote location of the proposed rail line and the infrequent train traffic, noise impacts from construction and operation would be expected to be small.

5.8.1.3 ITF and Use of Skull Valley Road

PFS's ER indicates that noise levels could be as high as 85 dB(A) at a distance of 15 m (50 ft) from the roadway during brief periods when heavy-haul truck transportation of casks is in progress (PFS/ER 2001). This noise level, which would be expected to occur on average about 4 times per week, is about the same as conventional tractor-trailers at normal highway speeds using Skull Valley Road. Because the heavy-haul vehicle would operate on Skull Valley Road at reduced speeds, the duration of such noise for nearby residents would be about 3 times longer than for other highway vehicles. The noise would be noticeable, and could be distracting at times. However, noise during transporation of SNF would occur only during daytime hours, when it is least likely to be annoying. Therefore, the noise impacts from this activity are expected to be moderate in the vicinity of Skull Valley Road during periods when the heavy haul vehicles are passing, and would otherwise be small.

5.8.1.4 Alternative Site B

A new rail corridor to Site B would require more construction than required for the preferred alternative because of the greater distance involved; a proportionally longer construction period would be expected. However, noise impacts from railway construction are expected to be small for rail access corridors to either Site A or Site B. If the selection of Site B would result in a more southerly location of the road from Skull Valley Road to that site, noise impacts could be appreciably greater than for Site A at the nearest residences.

Noise impacts from locomotives along the new access corridor or heavy-haul vehicles along Skull Valley Road would be the same for both Site A and Site B. If the road from Skull Valley Road to Site B is located further south than for Site A, noise impacts of operation from vehicles serving the proposed facility would also be greater at the nearest residences.

5.8.1.5 Mitigation Measures

Noise impacts can be mitigated by noise barriers, which are often costly. Such barriers are not warranted based on the level of impact. Assurance that construction-related vehicles are equipped with state-of-the-art mufflers can be very effective in reducing some of the most annoying noises from construction vehicles. Accordingly, the Cooperating Agencies propose that PFS be required to control temporary noise through the operation and maintenance of muffler systems on machinery.

Noise impacts from trains can be mitigated by noise barriers, which would be costly, would have negative aesthetic impacts, and could impede movements of animals along the right of way. Such barriers are not warranted based on the level of impact from train noise and the barrier's negative

effects. Sound propagation varies strongly with frequency; low frequency sounds (e.g., a tuba) can be heard at much greater distance than can high frequency sound (e.g., a flute) of the same energy level. Adjusting the frequency of train whistles could greatly reduce noise effects at distances beyond 1 km (0.6 mile); hence, the Cooperating Agencies recommend that PFS consider doing so.

5.8.2 Scenic Qualities

Construction and operation of the proposed rail line and siding or ITF would change the scenic quality of Skull Valley. Construction would create the short-term visual impacts of additional dust from the operation of heavy equipment on-site and additional vehicle traffic on local roads. Construction of the rail line would also have long-term visual impacts because the line would represent a visual contrast in the undeveloped area between Interstate 80 and the proposed PFSF site. Operation of the rail line would create long-term visual impacts by introducing railroad traffic to the undeveloped area between Interstate 80 and the proposed PFSF site. Operation of the ITF would have the long-term visual impacts of increasing truck traffic on Skull Valley Road.

Changes in the scenic quality of the landscape due to construction and operation of the new rail line and siding would represent moderate impacts to recreational viewers, small to moderate impacts to residents of Skull Valley, and small impacts to motorists traveling on Interstate 80. The staff concludes that construction and operation of the ITF would represent small to moderate impacts to the same groups. The following discussion explains the staff's conclusions, which are based on an analysis similar to that described in Section 4.1.8.2.

5.8.2.1 Recreational Viewers

Recreationists in Skull Valley and in areas adjacent to the valley would be able to view the new rail line and siding and the ITF. Recreationists in the Cedar Mountains would be able to view the rail line and siding (see Figure 5.3), while recreationists in the Stansbury Mountains might be able to view the ITF. However, the ITF would be located in a more developed area (i.e., adjacent to Interstate 80) than most of the new rail line, and would have less significant visual impacts. For many recreationists, particularly those seeking wilderness experiences in the Cedar Mountains, the new rail line in the midst of the nearly undeveloped landscape south of Interstate 80 would represent a noticeable contrast and a moderate visual impact.

5.8.2.2 Local Residential Viewers

The new rail line could be visible to residents of the Goshute Village because the rail line is between 5 and 20 km (3 and 12 miles) from the village. For some members who live on the Reservation, the aesthetic impact of the new rail line could be considered large. The staff concludes aesthetic impacts of the new rail line on residents would likely be moderate because its visual presence would alter the scenic qualities of Skull Valley as viewed from residential areas.



Figure 5.3. Artist's rendering of the proposed Skunk Ridge rail line as viewed from the Cedar Mountains.

5.8.2.3 Motorists on Interstate 80

The new rail line and siding and the ITF would be highly visible to motorists on Interstate 80 (see Figures 5.4 and 5.5). However, it is likely that visual impacts to these motorists would be small because they would view the new facilities in the context of existing development along Interstate 80. For example, the portion of the new rail line that would be visible from Interstate 80 would be an extension of the existing rail network that parallels Interstate 80 west of Salt Lake City. Also, it is likely that many motorists on Interstate 80 would not be as sensitive to the visual changes as some recreationists and local residents. Thus, the staff concludes that the visual impact of the proposed rail line and siding or the ITF on motorists on Interstate 80 would be small because the visual presence of these facilities would neither alter noticeably nor destabilize the scenic qualities of Skull Valley as viewed from Interstate 80.

5.8.2.4 Mitigation Measures

To the extent that they are applicable, the measures discussed in Section 4.8.2 should be used to mitigate the visual impacts of the new rail line and siding or the ITF. The Cooperating Agencies propose that PFS consult with BLM to develop an adequate plan for fire prevention, suppression, and rehabilitation during construction and operation of the rail line.

5.8.3 Recreation

Recreational uses of the land in Skull Valley include such activities as driving off-road vehicles, bird watching, and hiking. Direct and indirect impacts to recreational resources and opportunities during construction and operation of the new rail siding and corridor or the new ITF near Timpie and heavy-haul transport of SNF to the proposed site are expected to be small. The following paragraphs identify the potential for direct and indirect impacts associated with constructing each of these facilities, using these facilities to transport SNF to the proposed PFSF site, using these facilities to transport SNF to the Alternative Site B, and any mitigation measures that would reduce or ameliorate adverse impacts.

5.8.3.1 Construction Impacts

Direct impacts are primarily associated with any physical changes to those resources and opportunities that would result from construction of the transportation option. Indirect impacts are primarily associated with workers who might move into the area during construction of either of the local transportation options and who might place additional demands on existing resources and opportunities. As discussed in the following paragraphs, both direct and indirect impacts are expected to be small.

Activities associated with construction of the proposed rail line, including the movement of materials and workers to and from the rail head at Skunk Ridge and along the rail route, have the potential to affect recreational resources and opportunities. Impacts include the possible addition of obstacles (in the form of elevated roadbed) to existing unimproved roads ("jeep roads"), trails, or paths. Current unhindered access from Skull Valley to portions of the Cedar Mountains might be impaired at those locations where adequate rail crossings were not provided. The proposed rail route and alignment of the rail line from Skunk Ridge does not intersect or cross the existing Cedar Mountain WSA in the northern portion of the Cedar Mountains. The route passes within approximately 800 m (2600 ft) of



Figure 5.4. Artist's rendering of the proposed Skunk Ridge rail line as viewed from the Interstate 80 off-ramp at the Low interchange.



Figure 5.5. Artist's rendering of the proposed Intermodal Transfer Facility as viewed from the median of Interstate 80.

BLM lands found to contain wilderness characteristics. Hastings Pass, a segment of the California Trail, a designated National Historic Trail, is the northern boundary of newly inventoried BLM lands determined to contain wilderness characteristics. Persons wishing to use recreational resources within the Cedar Mountains WSA or other areas in the Cedar Mountains may expect delays during construction of the rail line. These impacts are expected to occur throughout the 14-month construction period. However, PFS's construction activities are expected to occur during weekdays and would not be expected to affect weekend use of the Cedar Mountain WSA or other nearby areas by recreational users.

Since demand on recreational resources varies directly with population, indirect impacts to recreational resources and opportunities are expected to be small due to the small amount of worker in-moving expected during construction of the proposed rail line. As indicated in Section 5.5, the number of in-moving workers is sufficiently small, even when added to any accompanying family members (approximately 0.3 percent of the Tooele County total population in 1996), that any increased demand placed by those workers and family members should not result in a noticeable effect on recreational resources and opportunities in the Cedar Mountains.

Activities associated with construction of the ITF near Timpie, including the movement of materials and workers to and from the construction site, have a very small potential to affect recreational resources and opportunities in the Skull Valley area. The location of the ITF, just off Interstate 80, would not affect recreational users' access to existing recreational resources and opportunities.

As with the proposed rail line, the indirect impacts are expected to be small due to the small workforce and any in-moving (approximately 0.1 percent of the Tooele County total population in 1996) associated with construction of the ITF (see Section 5.5).

5.8.3.2 Impacts During Operations

Direct and indirect impacts to recreational resources and opportunities during operation of the proposed rail line from Skunk Ridge to the proposed facility or the ITF and associated heavy-haul truck movement of SNF to the proposed facility are expected to be small. Activities associated with use of the rail line from Skunk Ridge to the proposed PFSF facility (i.e., an average of 1 to 2 rail shipments per week over the life of the facility) would have a minimal effect on recreational users of the Cedar Mountains and other areas on the western side of Skull Valley. Access to these areas over unimproved roads would not be curtailed during the operational period, except for the actual period of time it would take for a shipment to move past such an access road.

Indirect impacts to recreational resources and opportunities are expected to be small due to the small amount of worker in-moving expected during operation of the proposed rail line. The number of in-moving workers is sufficiently small, even when added to any accompanying family members, that any increased demand placed by those workers and family members should not result in a noticeable effect on recreational resources and opportunities in the Cedar Mountains.

Activities associated with operation of the ITF near Timpie, including the movement of heavy-haul trucks carrying SNF from the ITF down Skull Valley Road to the proposed facility, have a small potential to affect recreational resources and opportunities in the Skull Valley area. The location of the ITF, just off Interstate 80, would not affect recreational users' access to existing recreational resources and opportunities. However, persons wishing to use Skull Valley Road to access

recreational resources such as Horseshoe Springs or the Deseret Peak Wilderness would need to expect delays during the movement of the slow-moving heavy-haul trucks, currently planned for two to four round trips per week for the life of the facility. PFS's use of Skull Valley Road is expected to occur during weekdays and would not be expected to affect weekend use of Skull Valley Road by recreational users.

As with the proposed rail line, the indirect impacts of using the ITF/heavy haul local transportation option are expected to be very small due to the small workforce (estimated at four workers) and any in-moving associated with operation of the ITF.

5.8.3.3 Alternative Site B

The alternative location (i.e., Site B) in Skull Valley for the proposed facility lies just south of the preferred site. Because Site B is very close to the preferred site, there would be no discernible differences in the anticipated impacts to recreational resources and opportunities during either construction or operation of either of the local transportation options.

5.8.3.4 Mitigation Measures

Given the small magnitude of the impacts to recreational resources and opportunities expected to result from construction and operation of either of the two local transportation options of the proposed facility, no mitigation measures were identified that would appreciably reduce the impact.

5.8.4 Wildfires

Operation of a rail line from Skunk Ridge could result in fires from equipment sparking, as has been reported to occur elsewhere in the west (AmeriScan 1999); however, approximately three fires already occur each year in Skull Valley. Table 5.17 shows the number of fires, and the size of land affected, that occurred in BLM's Salt Lake District between 1989 and 1998. The Salt Lake District includes Skull Valley.

As can be seen in Table 5.17, fires caused by lightning dominate the number of fires in the region, as well as the acreage affected by fires. Fires caused by railroads account for only 1.7 percent of the number of all fires and only 0.5 percent of all acreage affected by all fires. When only human-caused fires are considered, fires caused by railroads account for about 10 percent of those fires and about 1.3 percent of all acreage burned by human-caused fires.

PFS will own or lease and maintain the rail equipment used for delivery of SNF to the storage facility. This equipment will utilize the latest design innovations (train monitoring, braking systems, etc.) to reduce the risk of wildfires due to rail transport. It is inherent in the design of rail equipment that sparks can be produced by the steel wheels of railroad trains in contact with the steel rails. Unlike cars and trucks, the axles on a train do not have differentials that permit the two wheels on one axle to rotate at different rates around curves. When a train moves around a curve, one of the wheels on the same axle slides along the rail to some extent, and this has a tendency to generate sparks.

Table 5.17. Number of fires and acres burned in BLM's Salt Lake District, 1989 through 1998

Cause of fire	Number of fires	BLM acres burned	Other acres burned	Acreage burned
Natural (lightning)	505	169,244	83,603	252,847
Human causes:				
Campfire	17	25	164	190
Smoking	8	1,270	287	1,557
Fire use	12	1,363	460	1,824
Incendiary	11	13,080	6,835	19,915
Equipment use	27	25,028	2,323	27,350
Railroads	15	607	1,359	1,966
Juveniles	2	11	0	11
Miscellaneous	53	67,319	28,833	96,152
Non-specific human-caused	1	0	0	0
Subtotal (all human caused)	146	108,704	40,261	148,965
Not classified	237	2,269	3,054	5,324
TOTAL	888	280,217	126,918	407,135

Notes:

(1) Data exclude false alarms.

(2) To convert acres to hectares, multiply the acreage by 0.405

Sparks can also be generated when the locomotive wheels slip while pulling a train uphill. There will be very few curves (no sharp curves) and no steep grades along the proposed Skunk Ridge rail corridor. Nevertheless, the possibility exists of sparks being produced by rail transport.

If a driver were to toss a lighted cigarette out the window of the vehicle, it is possible that a wildfire could start. This could occur whether the vehicle is a heavy haul truck or train, with similar likelihoods of starting a fire. Since trains can produce sparks from the metal rails, a condition that does not exist with the heavy haul option, it is considered that rail transport would have a slightly higher probability of causing wildfires than heavy haul truck transport. However, as noted above, the Skunk Ridge rail corridor with its minimum number of curves, no steep grades, and use of the latest equipment design innovations will minimize the risk of sparks that could lead to wildfires.

Because there is no evidence that the proposed rail line from Skunk Ridge would be more prone to cause fires than other railroad operations in BLM's Salt Lake District, it is concluded that the presence of the new rail line would not add significantly to the existing risk of fire in Skull Valley.

However, fires occurring on BLM land are investigated and a report is generated describing the cause of the fire. If it is determined that the rail line operation is the cause of the fire, the applicant would be obligated to pay for the cost of suppression.

If post-construction revegetation of the rail corridor follows BLM's fire management plan for Skull Valley (see BLM 1998c), it would be possible for the rail corridor to function as a green strip to help prevent the spread of both wildfires and those caused by operation of the rail line. Revegetation is discussed in detail in Section 5.4. The planting of species that both retard fires and also rehabilitate some of the areas where invasive annuals are currently growing could benefit vegetation by increasing biodiversity and improving local ecosystems.

The presence of the new rail line could also interfere with efforts to fight wildfires in Skull Valley. The elevated railbed could limit access across Skull Valley in an east-west direction and may impede the progress of fire-fighting personnel and equipment. The proposed rail line would include several rail crossings that could minimize the potential for the elevated railbed to adversely impact fire-fighting efforts.

5.8.4.1 Mitigation Measures

To mitigate potential impacts to fire fighting efforts, the Cooperating Agencies propose that PFS be required to consult with BLM to determine the appropriate design, number, and locations for rail crossings to allow fire suppression equipment to cross the rail line. The Cooperating Agencies propose that this mitigation measure be required (see Section 9.4.2). The Cooperating Agencies recommend that PFS further reduce the potential for fire resulting from rail line operations by the use of modern rail equipment and good maintenance.

5.9 Decommissioning

Decommissioning activities are described in Section 2.1.6; however, the actual actions taken to decommission the transportation corridor cannot be predicted at this time. If the decommissioning of the rail corridor or ITF is elected then the impacts similar to those described in the following paragraphs could occur.

5.9.1 Skunk Ridge Rail Line Corridor

Upon expiration of the right-of-way, the rail line would be removed and reclaimed in accordance with the Plan of Development and right-of-way grant from the BLM. This plan calls for the rail and ballast to be removed and the remainder of the grade to be recontoured and reseeded. PFS would also need to file an application for abandonment authority with the STB. The potential environmental impacts of abandoning the rail corridor would be addressed by further NEPA documentation at that time; however, it is expected that the types of impacts that would accompany the removal of the Skunk Ridge rail siding and rail corridor would be similar to or less than those associated with the construction of those facilities. These impacts have been determined to be small to moderate (see Sections 5.1 through 5.8). The rail bed ballast and subballast would be removed and recovered for future reuse. The steel rails could be removed and reused or recycled as scrap metal. Revegetation

would occur in a manner similar to that for decommissioning and closing the proposed PFSF (see Section 4.9).

5.9.2 New ITF Near Timpie

Under the alternative of constructing and operating an ITF near Timpie, the current decommissioning plans call for the ITF to be dismantled and removed upon closure of the proposed PFSF and the area recontoured and revegetated with appropriate native plant species (see the discussion of revegetation in Section 4.9). The types of impacts that would accompany the removal of the ITF would be similar to those discussed in Sections 5.1 through 5.8 for the construction of the facility. These impacts have been determined to be small.

The rail bed ballast and subballast from the rail sidings at the ITF would be removed and recovered for future use. The steel rails could be removed and recycled as scrap metal. The foundations of the building, the loop road, and the access road would be demolished and converted into solid waste that would be sent to an appropriate landfill for disposal.

5.9.3 Potential Worker Injuries During Decommissioning

The proposed rail line may be left in place for future uses. However, should the rail line be decommissioned, it is assumed that it would take the same amount of time and number of workers to complete the decommissioning activities as it would take originally to construct the rail line. Thus, the estimates above for construction of the rail line can be applied to decommissioning (see Table 5.4). Using this same line of reasoning, the estimates above for the construction of the ITF can also be applied to its decommissioning.

6. SUMMARY OF IMPACTS

Chapter 4 presents the potential environmental impacts of constructing and operating the proposed PFSF on the Reservation. Chapter 5 presents the environmental impacts of constructing and operating new SNF transportation facilities in Skull Valley and transporting SNF to the proposed PFSF. This chapter combines the findings of Chapters 4 and 5 and presents the potential environmental impacts from the perspective of the whole project as proposed by PFS. This chapter presents and summarizes the information needed to compare the potential environmental impacts among and between alternatives. A detailed comparison is contained in Chapter 9. In addition this chapter considers impacts associated with environmental justice and the no-action alternative.

This chapter discusses the following combinations of alternatives from Chapters 4 and 5:

- Alternative 1: PFS's proposed action: Construction and operation of the proposed PFSF at Site A on the Reservation, a new rail siding at Skunk Ridge, and a new rail corridor connecting the Skunk Ridge siding with Site A.
- Alternative 2: Construction and operation of the proposed PFSF at Site B on the Reservation, with the same Skunk Ridge rail siding and rail corridor as described above.
- Alternative 3: Construction and operation of the proposed PFSF at Site A, and construction and operation of a new ITF near Timpie with the use of heavy-haul vehicles to move SNF down Skull Valley Road.
- Alternative 4: Construction and operation of the proposed PFSF at Site B, with the same ITF as described above.

This chapter presents no new analyses not already included in Chapters 4 or 5, with the exceptions of environmental justice and the no-action alternative. Rather, this chapter brings together the analyses from those previous chapters and (in Section 6.1) offers a combined interpretation of the impacts from those chapters. In addition, this chapter presents the cumulative impacts of the entire project (see Section 6.3); provides a project-wide discussion of environmental justice (see Section 6.2); discusses the unavoidable adverse environmental impacts (see Section 6.4), the relation of the short-term uses of the environment and its long-term productivity (see Section 6.5), the irreversible and irretrievable commitment of resources for the whole project (see Section 6.6); and presents the potential environmental impacts of the no-action alternative (see Section 6.7).

6.1 Impacts of the Proposed Action and Its Alternatives

Table 6.1 summarizes the significance levels of the combined impacts of constructing and operating the proposed PFSF and the proposed new transportation facilities in Skull Valley. A detailed discussion of the entries in Table 6.1 is presented in the following subsections.

6.1.1 Geology, Minerals, and Soils

This section discusses the combined impacts to the soils and economic geologic resources from the combined actions described in Chapters 4 and 5.

Table 6.1. Summary of significance levels^a of the combined potential impacts for Skull Valley alternatives addressed in this FEIS

Potentially impacted resource or category	Proposed action (i.e., Site A with the rail corridor)—Alternative 1	Site B with the rail corridor—Alternative 2	Site A with the ITF—Alternative 3	Site B with the ITF—Alternative 4
Geology, minerals, and soils	SMALL	SMALL	SMALL	SMALL
Water resources				
Surface water	SMALL	SMALL	SMALL	SMALL
Flooding	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL
Water use	SMALL	SMALL	SMALL	SMALL
Groundwater	SMALL	SMALL	SMALL	SMALL
Air quality	SMALL TO MODERATE	SMALL TO MODERATE	SMALL TO MODERATE	SMALL TO MODERATE
Ecological resources				
Vegetation	SMALL	SMALL	SMALL	SMALL
Wildlife	SMALL	SMALL	SMALL	SMALL
Wetlands	SMALL	SMALL	SMALL	SMALL
Perennial and ephemeral streams	SMALL	SMALL	SMALL	SMALL
Threatened and endangered species	SMALL	SMALL	SMALL	SMALL
Socioeconomics and community resources				
Human population	SMALL	SMALL	SMALL	SMALL
Housing	SMALL	SMALL	SMALL	SMALL
Education	SMALL	SMALL	SMALL	SMALL
Utilities	SMALL	SMALL	SMALL	SMALL
Solid and sanitary waste	SMALL	SMALL	SMALL	SMALL
Traffic	SMALL TO MODERATE	SMALL TO MODERATE	SMALL TO MODERATE	SMALL TO MODERATE
Economic structure ^b	SMALL TO MODERATE (but beneficial)	SMALL TO MODERATE (but beneficial)	SMALL TO MODERATE (but beneficial)	SMALL TO MODERATE (but beneficial)
Land use (including rangeland and impacts to military overflight operations)	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL

Table 6.1. Continued

Potentially impacted resource or category	Proposed action (i.e., Site A with the rail corridor)—Alternative 1	Site B with the rail corridor—Alternative 2	Site A with the ITF—Alternative 3	Site B with the ITF—Alternative 4
Cultural resources	SMALL TO MODERATE	SMALL TO MODERATE	SMALL	SMALL
Human health impacts				
Non-radiological risks to workers	SMALL	SMALL	SMALL	SMALL
Radiological doses to the public	SMALL	SMALL	SMALL	SMALL
Radiological doses to workers	SMALL	SMALL	SMALL TO MODERATE	SMALL TO MODERATE
Radiological non-transportation accidents	SMALL	SMALL	SMALL	SMALL
Transportation of SNF	SMALL	SMALL	SMALL	SMALL
Radiological transportation accidents	SMALL	SMALL	SMALL	SMALL
Non-radiological transportation accidents	SMALL	SMALL	SMALL	SMALL
Noise	SMALL	SMALL	SMALL	SMALL
Scenic qualities	MODERATE	MODERATE	MODERATE	MODERATE
Recreation	SMALL	SMALL	SMALL	SMALL
Environmental justice	SMALL	SMALL	SMALL	SMALL

^aSignificance levels in this table represent the combination of impacts addressed in detail in Chapters 4 and 5 of this FEIS.

^bEconomic benefits to the Skull Valley Band would be large.

6.1.1.1 Impacts of Alternative 1

Soils and economic geologic resource impacts occur from the construction and operation of the proposed PFSF and the Skunk Ridge rail line. Soils resources used in the soil/cement pad base mixture would be permanently lost; however, they constitute only a small percentage of the similar available soils in the valley. The remainder of soils are used in project construction as slope or embankment dressing, and these soils are recoverable upon facility decommissioning. No excess soils would be generated that require off-site shipment or disposal.

Economic geologic resources (e.g. aggregate) would be required for construction, and sufficient material is available locally to meet these needs. Like the soils resource, aggregate materials used in construction are recoverable upon facility decommissioning and are not lost. Other economic geologic

resources (such as minerals or oil and gas, if any) would be unavailable for exploitation during facility construction and operation. However, similar minerals are widely available elsewhere in the region.

In summary, impacts of the proposed action on the soils and economic geologic resources is small.

6.1.1.2 Impacts of Alternative 2

The impacts on the soils and economic geologic resources from Alternative 2 are similar to those from Alternative 1.

6.1.1.3 Impacts of Alternative 3

Soils and economic geologic resource impacts occur from the construction and operation of the proposed PFSF and the ITF. Soils and economic resource impacts for the proposed PFSF are the same as those in the proposed action. Fewer mineral resources would be required for construction of the ITF than the new rail line. However, since these materials are readily available locally and can be recovered at decommissioning, the impacts of this alternative are not significantly different than those associated with the proposed action.

6.1.1.4 Impacts of Alternative 4

Soils and economic geologic resource impacts for this alternative are similar to those of using Site A with the ITF.

6.1.2 Water Resources

6.1.2.1 Impacts of Alternative 1

Surface water. Construction and operation of the proposed PFSF with the new rail line and the proposed access road would have small impacts on surface water hydrology. Under extreme flooding conditions during construction, small to moderate impacts could result from soil erosion and sedimentation of surface water channels. No adverse impacts on surface water quality are anticipated.

The proposed PFSF design includes earthen berms to protect the fuel storage pads and related facilities from flooding up to and including the PMF. The access road and rail line would cross channels that carry ephemeral flows during wet seasons and would also carry surface water flow during floods. All drainage features under access route embankments, including the access road and the rail line, are designed to carry flood water volumes that would occur during the 100-year storm event. Some portions of the access road and rail line would be inundated by as much as 1 m (3 ft) of floodwater during a flood of PMF severity. The presence of the PFSF and its access routes would not increase downstream flooding potential. During extreme flooding some temporary water ponding would likely occur upstream of the access road and railroad culverts within the floodways associated with surface runoff channels.

Potential impacts related to surface water hydrology include minor localized channel alterations that would be caused by the presence and functioning of flood control berms at the proposed PFSF, and embankments and culverts associated with the site access road and the rail line. Ephemeral surface runoff in the dry washes upslope of the facility would be re-routed around the facility. Channel

modifications along access routes would be minimized by use of energy dissipating structures and materials at culvert inlets and outlets; however, some changes in channel morphology and sediment distribution would likely occur within short distances upstream and downstream of channel crossings.

Groundwater. Small impacts to groundwater availability or groundwater quality could occur as a result of construction and operation of the PFSF and the rail line access.

Groundwater from wells at or near the site would be used for human consumption at the site and to provide water to the concrete batch plant at the site. The estimated peak groundwater use rate during construction would be about 20 to 40 L/min (5 to 10 gal/min). One or more wells on site would be required to provide the required groundwater volume. There is uncertainty as to the adequacy of the aquifer at the site to produce the required quantity of water required for facility construction and operation; however, PFS has identified an alternate water supply, if required.

To fulfill project construction water requirements, water would be acquired from offsite sources and transported to the site and access routes for use in dust control, soil compaction, and mixing of soil cement for the storage pad foundations. Water of sufficient quantity and quality is commercially available within trucking distance of the construction areas. Approximately 279,031 m³ (74 million gallons) of water would be required for rail line construction, and approximately 14,327 m³ (3.8 million gallons) for Phase 1 construction of the site. Use of groundwater from the site at the estimated rate would not be expected to impact other existing groundwater users in Skull Valley.

No activities or processes would occur at the proposed PFSF that would adversely impact groundwater quality. Stormwater runoff from the SNF storage pads and process areas, which is not expected to contain contaminants, would flow into a surface water detention basin where percolation into site soils and evaporation would occur. The facility would have two septic tanks with leach fields. In view of PFS's plan to use BMPs, and the Cooperating Agencies' proposal that PFS be responsible for clean-up in conformance with applicable standards in the event of leaks or spills of vehicle fuels, there would be no potential for petroleum contamination of groundwater.

6.1.2.2 Impacts of Alternative 2

The hydrological impacts of using Site B in Skull Valley with the rail line are expected to be small and would be similar to using Site A with the rail line, since Site B and Site A are adjacent to one another, and the site soils, surface water, and groundwater characteristics are similar.

6.1.2.3 Impacts of Alternative 3

The hydrological impacts for the option of constructing the ITF and using Skull Valley Road would be small, as discussed below.

Surface water. Potential surface water impacts using Site A with the ITF and heavy haul truck transport of the SNF shipping casks would have small impact on surface water features. There is no potential for flooding at the ITF site.

Groundwater. There would be no significant differences in groundwater use if the ITF were used rather than the rail line. Construction of the ITF would require approximately 25,800 m³ (6.9 million gallons) of water for earthwork and cement, which would be obtained from commercial sources. There would be a somewhat smaller potential for construction-related leaks or spills of

vehicle fuel if the ITF and Skull Valley Road were used rather than the proposed rail line corridor. Use of Skull Valley Road for fuel cask transport would slightly increase the possibility of vehicle accidents resulting in spills that could impact surface water or groundwater quality.

6.1.2.4 Impacts of Alternative 4

The hydrological impacts of using Site B in Skull Valley with the ITF are expected to be small and would be similar to using Site A with the ITF, since Site B and Site A are adjacent to one another, and the site soils, surface water, and groundwater characteristics are similar.

6.1.3 Air Quality

6.1.3.1 Impacts of Alternative 1

As discussed below, the temporary and localized effects of construction could produce occasional moderate impacts on air quality in the immediate vicinity of the construction activity along the proposed rail line and small impacts elsewhere. Air quality impacts of operation would be small.

Analysis using the EPA air dispersion model ISCST3 (EPA 1995), discussed in Section 4.3, indicates that air quality impacts would be largely confined to an area well within 3 km (2 miles) of any construction activities, and within much smaller distances with routine mitigation of fugitive dust. Because of the large distance between the proposed storage facility and most of the related rail line, natural air dispersion processes would greatly dilute any pollution plume arising from rail line construction before it could mix with pollutants from the proposed PFSF construction activities, and vice-versa; therefore, impacts would not be additive except when that portion of the rail line adjacent to the storage site is under construction. That case was considered in the modeling of site construction in Section 4.3, where some rail line construction was included. The impacts from construction of the rail line are described in Section 5.3. Other effects would not be additive.

Combined effects of operation would be dominated by pollutants from fossil fuel combustion by locomotives. However, air quality impacts of the switchyard locomotive and other vehicles and equipment used during operation would be small.

6.1.3.2 Impacts of Alternative 2

The impacts of Site B and the rail line would be difficult to distinguish from those for Site A with rail transport and would therefore be small to moderate. Construction would have to include about 2 percent more rail line; and proportionally (i.e., 2 percent) more pollutants would be generated each time a locomotive used the line.

6.1.3.3 Impacts of Alternative 3

As discussed below, the temporary and localized effects of construction could produce occasional moderate impacts on air quality in the immediate vicinity of the construction activity at the ITF location and small impacts elsewhere. Air quality impacts of operation would be small.

As in the case of rail transport, the distance between the ITF and the storage facility precludes any appreciable combined effects of pollution from both sources, for both construction and operation of the proposed PFSF. Road construction adjacent to the storage facility was included in the modeling of

fugitive dust from construction in Section 4.3, and has therefore been considered as a part of the storage facility construction. Because the ITF would obviate the need to construct a rail line, a large amount of rail line construction would be eliminated if this combination of options were chosen, and much less construction-related dust would be generated. Air emissions from cask-transport vehicles would be similar to those of locomotives under the rail line alternatives.

6.1.3.4 Impacts of Alternative 4

The impacts of Site B with the ITF would be similar to those for Site A with an ITF facility, and would be small.

6.1.4 Ecological Resources

6.1.4.1 Impacts of Alternative 1

Vegetation. Combined direct impacts on vegetation resulting from the construction of the proposed PFSF and a rail corridor and siding to the site would involve clearing approximately 408 ha (1,008 acres) of land (Table 2.4), which is now covered primarily by degraded desert shrub/saltbush vegetation with a high proportion of non-native cheatgrass. About 29 percent [120 ha (295 acres)] of this cleared area would be occupied for the life of the project by buildings, the cask storage pads, the access road, the rail corridor and siding, and other ancillary facilities. The remaining 71 percent [288 ha (713 acres)] of the cleared area would be revegetated, either with native species or crested wheatgrass. Because (1) the total area cleared amounts to less than 0.4 percent of the land area of Skull Valley, (2) the existing vegetation is already heavily disturbed and dominated in many areas by non-native species, (3) no unique or sensitive areas of vegetation are known to occur in the vicinity of the proposed project, and (4) substantial portions of the areas cleared would be replanted with either native species or a perennial grass, the impacts on vegetation are considered to be small.

Potential indirect effects of fugitive dust from construction of the proposed PFSF and rail line on vegetation are expected to be small because dust control measures would be used throughout the construction period, and the existing vegetation in this type of environment is not sensitive to such emissions.

Direct and indirect impacts of operation of the proposed PFSF on vegetation would be small. During operation of the proposed PFSF, no additional disturbance of soils or vegetation would occur beyond that already discussed above for construction; hence no additional impacts from the disturbance of soils or vegetation should occur. Other potential impacts include additional wildfires from equipment sparking as has been reported to occur elsewhere in the west (AmeriScan 1999). No other indirect impacts to vegetation are anticipated from operation of the proposed PFSF and rail line because atmospheric emissions are expected to be minor and groundwater withdrawal at the facility would be below the rooting zone of plants.

Wildlife. As discussed above, the combined construction activities for the proposed PFSF and rail line would disturb approximately 408 ha (1,008 acres) of desert shrub/saltbush wildlife habitat. This disturbance would reduce habitats for wildlife species such as jack rabbits, small mammals, and birds. Certain species such as mule deer and pronghorn antelope might be forced to change their movement patterns due to the installation of fencing around the proposed PFSF and the elevated rail bed along the Skunk Ridge rail corridor.

During construction, wildlife, such as ground squirrels, kangaroo mice, pocket gophers, and small reptiles could be displaced or lost due to the excavation of soils. There would be a loss of nest sites for certain species of birds and burrow sites for species such as gophers and burrowing owl. This reduction of animals and wildlife habitat would have a small negative impact on the abundance of prey for predatory species, such as hawks, eagles, owls, and fox species. However, the loss of wildlife habitat due to clearing is expected to have only a small adverse impact because less than 0.4 percent of existing Skull Valley habitat would be disturbed by the combined construction activities of the proposed PFSF and rail line.

As noted above, there are no permanent streams on the site of the proposed PFSF, and the proposed Skunk Ridge rail line would cross 32 ephemeral streams (Section 2.1.1.3). These seasonally wet areas are important to many wildlife species, including pronghorn antelope and mule deer. Following BLM and STB BMPs is expected to result in only small impacts to these streams.

The operation of the proposed PFSF project would result in a number of potential impacts to wildlife. Roaming animals may need to adjust their movements and migration patterns from time to time due to the increased traffic in the area. The Skunk Ridge rail corridor would bisect areas between the western side of Skull Valley and the Cedar Mountains, and potentially affect the movement of wildlife across this area. While both pronghorn antelope and mule deer use these areas for habitat during winter, no critical wintering or fawning areas for these species are known to occur along this route. Impacts of the rail corridor on movement of wildlife are expected to be small, however, in view of the mitigation measures discussed in this FEIS to provide adequate crossings of the rail line.

During operation, wildlife could be attracted to the casks, buildings, landscaping plants and trees, power lines and poles, and light posts of the proposed PFSF. Birds, mammals, and reptiles may be attracted to the cask storage area in the winter, as this area would be warmer than the ambient air. Birds may use the proposed PFSF structures, such as the storage casks, for perching and potential nesting because of the limited perching and nesting sites now available in the vicinity of the proposed site. Although perching or nesting on or in the immediate vicinity of the storage casks could result in exposure of birds and small mammals to radiation (Section 4.4.2), only small impacts to wildlife populations are likely to occur given the radiation doses at the surface of the casks and implementation of appropriate mitigation, including a rigorous monitoring plan to discourage animals from remaining in the vicinity of the casks for any significant period.

The possibility of increased fire frequency resulting from operation of the rail line could result in some increased mortality for wildlife species that are not very mobile (i.e., small mammals and certain nesting birds). As discussed in the previous section, planting of crested wheatgrass and native species along the rail corridor would reduce the frequency of fires, and thus reduce any impacts on susceptible wildlife species. Because the frequency of wildfires is not expected to increase significantly above current levels, the impacts to small mammals and those species dependent on small mammal prey species are expected to be small.

Wetlands. The impacts to wetlands from construction of the proposed PFSF are anticipated to be small because there are no wetlands on or near the proposed PFSF or in the vicinity of the rail line and siding. The only potential impact to wetlands would be from increased recreational use of the area in the northern part of Skull Valley around Horseshoe Springs, and it should be small.

Perennial and ephemeral streams. Construction of the proposed PFSF and rail line would have only a small impact on streams. Because there are no surface water flows in the vicinity of the proposed

PFSF, no impacts to streams would occur. The proposed Skunk Ridge rail corridor would cross 32 ephemeral streams (Section 2.1.1.3). Depending upon the time of year that rail construction occurs, disturbed soils entrained by these ephemeral desert washes could create minor short-term increases in the turbidity of any water in such streams. However, these impacts on streams are expected to be small because best management practices would be used to control and limit soil erosion during construction.

Threatened and endangered species and other species of concern. No Federally listed or State-listed threatened or endangered plant species are known to be present in the vicinity of the proposed PFSF, rail line, and rail siding. Pohl's milkvetch, a State species of concern, could be present in the area of the Hickman Knolls Pit located about 9.5 km (6 miles) west of the proposed PFSF site, but has not been found at the proposed PFSF or rail corridor.

Potential impacts to threatened, endangered, and other wildlife species of special concern from the construction and operation of the proposed PFSF include loss of habitat and wildlife species being potentially exposed to radiation. Many raptors that are potentially present in Skull Valley are State or Federally listed. Another listed predatory bird, the loggerhead shrike, is also found in Skull Valley. Construction activities along the rail corridor could disturb or destroy nesting habitat important to these species. With appropriate mitigation measures (e.g., surveys prior to construction), impacts to these species could be avoided or minimized and are thus predicted to be small.

Habitat for mammals, including the BLM-listed kit fox, would be reduced by construction of the Skunk Ridge rail line. This species might also be displaced or forced to change movement or migration patterns. Since the amount of habitat is a very low percentage of the available habitat in Skull Valley, impacts to this fox are predicted to be small. Skull Valley pocket gophers could also be displaced or destroyed as a result of the construction of the rail line. With the implementation of surveys prior to construction, anticipated impacts to these gophers could be avoided or minimized, and would thus be small.

6.1.4.2 Impacts of Alternative 2

Direct and indirect impacts to vegetation from constructing and operating the proposed PFSF at Site B on the Reservation along with the proposed Skunk Ridge rail corridor and rail siding at Low would be similar to those for the proposed action. The Skunk Ridge rail corridor to Site B would require an additional 10 ha (24 acres) of land. Thus, the total area of vegetation that would be cleared under this alternative would be about 418 ha (1,032 acres). This area of disturbance is small relative to the total land area of Skull Valley. About 71 percent of the disturbed area would be revegetated after construction. The type and quality of existing vegetation at Site B and the additional area that would be used for the rail corridor are similar to that at Site A, and no unique or sensitive species or plant communities are known to be present. The impacts to vegetation from this alternative are, therefore, considered to be small.

Impacts to wildlife from constructing and operating the proposed PFSF at Site B with the rail transportation option would be small because the site and additional area needed for the rail corridor are essentially the same type of habitat as is present on Site A. Because of the longer rail corridor, an additional 10 ha (24 acres) of wildlife habitat would be lost, but there is no unique or sensitive wildlife habitat known to be present on Site B or the area needed for the additional rail corridor segment. Thus, the impact of this alternative on wildlife is expected to be small.

There are no wetlands, perennial or ephemeral streams, or threatened or endangered plant or animal species known to be present on Site B. Use of the site and area by threatened and endangered species, or species of concern would be similar to use of Site A, except that Site B is closer to known locations of Pohl's milkvetch and, thus, impacts of constructing the facility at that site could be larger than at Site A. Impacts are anticipated to be small with implementation of required mitigation.

6.1.4.3 Impacts of Alternative 3

Impacts of constructing and operating the proposed PFSF at Site A and an ITF near Timpie, and using heavy-haul vehicles to transport SNF from the rail line to the site would be small. Only 98.5 ha (243 acres) of vegetation and wildlife habitat would be cleared, and about 38 percent [37 ha (92 acres)] of the cleared area would be revegetated. Under this alternative, the amount of disturbed habitat would be less than 0.1 percent of land in Skull Valley.

Assuming the use of an ITF, impacts of constructing and operating the proposed PFSF at Site A on vegetation; wildlife; endangered, threatened, and special concern species; wetlands; and streams would be less than those for the proposed action and would be small, particularly with implementation of recommended mitigation measures.

Impacts on vegetation and wildlife of constructing and operating the ITF near Timpie would also be small because the 4.5-ha (11-acre) site is already disturbed and does not support any known unique or sensitive vegetation or wildlife habitat. None of the area to be cleared at the ITF near Timpie [4.5 ha (11 acres)] would be revegetated. There are no wetlands or perennial or ephemeral streams in the area of the proposed ITF near Timpie. No plant species of special concern are known to occur in the area of the ITF. The State-listed endangered peregrine falcon is known to have nested a few miles to the east of the ITF at the Timpie Springs Waterfowl Management Area, but it is unlikely that these birds use the proposed Timpie ITF site or would be disturbed by construction and operation of the ITF. Thus, construction and operation of the ITF would at most cause only a small impact to ecological resources at the proposed ITF or in its immediate vicinity. Less clearing of vegetation and wildlife habitat would be needed than under Alternative 1 since no rail corridor would be built and only existing roads would be used. Therefore, impacts for Alternative 3 would be less than those for Alternative 1.

6.1.4.4 Impacts of Alternative 4

Constructing and operating the proposed PFSF at Site B and an ITF near Timpie and using heavy-haul vehicles for transporting SNF from the rail line to the site would have impacts on ecological resources similar to those described for the use of Site A with the ITF because the vegetation and wildlife habitat at Site B are essentially the same as for Site A. Thus, the impacts on ecological resources are anticipated to be small with the mitigation measures proposed to be required by the Cooperating Agencies.

6.1.5 Socioeconomic and Community Resources

As described in Sections 4.5 and 5.5, impacts to the socioeconomic and community resources of the Skull Valley Band and their Reservation are indistinguishable from those to the remainder of Tooele County with the exceptions of population, land use, and economic structure. Impacts specific to the Skull Valley Band, as compared to the remainder of Tooele County, are noted in the following discussion as appropriate. Because only Skull Valley Band members and their spouses may live on

the Skull Valley Reservation (see Section 6.2.1.1), impacts on Reservation population, housing, education, utilities, and solid and sanitary waste would be small.

6.1.5.1 Impacts of Alternative 1

Population. The effects of the proposed action on population would be small. As demonstrated in Sections 4.5 (construction and operation of the proposed PFSF at Site A) and 5.5 (construction and use of the rail line), the total increase in population would amount to approximately 0.6 percent of Tooele County's 1996 population during construction and less than that during operations.

Housing. The effects of the proposed action on housing are small. As demonstrated in Sections 4.5 (construction and operation of the proposed PFSF at Site A) and 5.5 (construction and use of the rail line), the total increase in housing requirements would amount to approximately 26 percent of vacant housing units for sale or rent in 1990 for Tooele County during construction and approximately one-half that proportion during operations. Even if all in-moving workers decided to locate in a single community, which is highly unlikely, the existing housing market is likely to be able to accommodate the demand.

Education. The effects of the proposed action on education are small. As demonstrated in Sections 4.5 (construction and operation of the proposed PFSF at Site A) and 5.5 (construction and use of the rail line), the total increase in school-age children would amount to approximately 0.5 percent of existing enrollment in 1997 for Tooele County during construction and somewhat less than that during operations. This increase would not place a substantial burden on the local school system.

Utilities. The effects of the proposed action on utilities are small. There may be some improvement to electrical service if upgrades are required for the proposed PFSF. The small number of in-moving workers would likely live in existing housing that would not require additional utility hookups during construction and operations.

Solid and sanitary waste. The effects of the proposed action on the management of solid wastes are small. The actual quantities of solid wastes are expected to be small during both construction and operation of the proposed PFSF and rail line and would be shipped to licensed landfills or to permitted low-level waste facilities, as appropriate. Spoils resulting from construction of the proposed PFSF and the proposed rail line would be reapplied for grading purposes, and vegetative wastes along the proposed rail line would be shredded and scattered in place. Hazardous wastes, if any are generated, would be disposed at permitted facilities in accordance with their hazardous nature.

Transportation and traffic. The temporary effects of the proposed action on transportation are small to moderate. The period of greatest traffic impact would occur during the first period of the first phase of constructing the proposed PFSF (the first 6 to 8 weeks), when traffic delays along Skull Valley Road may result due to a 138 percent increase in use of the road for the movement of construction materials and workers. The contribution to adverse transportation impacts resulting from construction of the proposed rail siding and rail line would be minimal (accounting for only a 4.5 percent increase in traffic along Interstate 80) and would be spatially separate from impacts along Skull Valley Road. Impacts during operation of the proposed PFSF and use of the rail line for the movement of SNF would be substantially less.

Land use. The effects of the proposed action on land use are small to moderate. Impacts to land use for construction of the proposed PFSF would be expected to be quantitatively small (since a small proportion of the total land of the Reservation and an even smaller proportion of land within Skull Valley would be altered), even if the change would be qualitatively different. Construction of the proposed rail line, however, could result in reduced availability of grazing resources, including access to livestock watering resources, during both construction and operation. Impacts to land use are not considered to be additive for the proposed PFSF and the proposed rail line since they are geographically distinct and different in nature. The indirect impacts (i.e., the impacts generated by in-moving workers) of both the proposed PFSF and the proposed rail line construction and use are expected to be small.

Economic structure. The effects of the proposed action on the local economic structure would be beneficial and small to moderate in magnitude. Constructing the proposed PFSF and the proposed rail line would directly result in approximately 255 jobs during the peak of construction, and many of these jobs are likely to be filled by workers from Tooele County or from other counties within commuting distance. The peak construction period may last only a few months, at which point fewer workers would be required. The labor market available in Tooele County and other counties within commuting distance is capable of supplying most if not all of these positions.

In addition to jobs, it is expected that construction and operation of the proposed PFSF would result in increased business for the Pony Express Convenience Store on the Reservation and for other businesses and suppliers in the area. Also, there would be a large benefit to the Skull Valley Band and to Tooele County in the form of payments under the lease and the PFS-Tooele County agreement for the duration of the proposed PFSF's operation.

6.1.5.2 Impacts of Alternative 2

Because Site B is very close to Site A, there would be no discernible differences in the anticipated impacts to socioeconomic and community resources during construction and operation of the proposed PFSF if it were to be located at Site B. Similarly, the impacts due to construction and operation or use of the proposed rail line would be identical to those described above for the proposed action. Consequently, the combined impacts to socioeconomic and community resources for this alternative are considered similar, if not identical, to those identified for the proposed action.

6.1.5.3 Impacts of Alternative 3

Population. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on population are small. As demonstrated in Sections 4.5 (construction and operation of the proposed PFSF at Site A) and 5.5 (construction and use of the ITF/heavy-haul local transportation option), the total increase in population would amount to approximately 0.4 percent of Tooele County's 1996 population during construction and less than that during operations.

Housing. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on housing are small. As demonstrated in Sections 4.5 (construction and operation of the proposed PFSF at Site A) and 5.5 (construction and use of the ITF/heavy-haul local transportation option), the total increase in housing requirements

would amount to approximately 17.2 percent of vacant housing units for sale or rent in 1990 for Tooele County during construction and approximately three-fourths that proportion during operations. Even if all in-moving workers decided to locate in a single community, which is highly unlikely, the existing housing market is likely to be able to accommodate the demand.

Education. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on education are small. As demonstrated in Sections 4.5 (construction and operation of the proposed PFSF at Site A) and 5.5 (construction and use of the ITF/heavy-haul local transportation option), the total increase in school-age children would amount to approximately 0.3 percent of existing enrollment in 1997 for Tooele County during construction and somewhat less than that during operations. This increase would not place a substantial burden on the local school system.

Utilities. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on utilities are small. The small number of in-moving workers would likely live in existing housing that would not require additional utility hookups during construction and operations.

Solid and sanitary waste. The combined effects of constructing and operating the proposed PFSF at Site A and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on the management of solid wastes are small. The actual quantities of solid wastes are expected to be small during both construction and operation of the proposed facility and would be shipped to licensed landfills or to permitted low-level waste facilities, as appropriate. Spoils resulting from construction of the proposed PFSF and the ITF would be reapplied for grading purposes. Hazardous wastes, if any are generated, would be disposed of at permitted facilities in accordance with their hazardous nature.

Transportation and traffic. The combined effects of constructing and operating the proposed PFSF at the proposed site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on transportation are small to moderate. The period of greatest traffic impact would occur during the first period of the first phase of constructing the proposed PFSF (the first 6 to 8 weeks), when temporary traffic delays along Skull Valley Road may result due to a 138-percent increase in use of the road for the movement of construction materials and workers. There is the potential for increased wear and maintenance requirements on Skull Valley Road due to heavy truck traffic. The contribution to adverse transportation impacts resulting from construction of the ITF would be minimal (accounting for only a 1.2 percent increase in traffic along Interstate 80) and would largely be spatially separate from impacts along Skull Valley Road. Impacts during operation of the proposed PFSF and use of the ITF and Skull Valley Road for the movement of SNF would be substantially less than during construction, although traffic delays may result along Skull Valley Road during the movement of fabricated steel liners and 2 to 4 shipments per week of SNF storage casks to the proposed PFSF.

Land use. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on land use are small. Impacts to land use for construction of the proposed PFSF would be expected to be quantitatively small (since a small proportion of the total land of the Reservation and an even smaller proportion of land within Skull

Valley would be altered), even if the change would be qualitatively different. Construction of the ITF would have minimal land use impacts since the site had been previously disturbed. Impacts to land use are not considered to be additive for the proposed PFSF and the ITF since they are geographically separate. The indirect impacts (i.e., the impacts generated by in-moving workers) of both the proposed PFSF and the ITF construction and use of Skull Valley Road for movement of materials, workers, SNF on land use would be expected to be small.

Economic structure. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing and operating the ITF and transporting SNF to the proposed PFSF at Site A by heavy-haul tractor trailer along Skull Valley Road on the local economic structure would be beneficial and small to moderate in magnitude. Constructing the proposed PFSF and the ITF would result in approximately 165 jobs during the peak of construction, and many of these jobs are likely to be filled by workers from Tooele County or from other counties within commuting distance. The peak construction period may only last a few months, at which point fewer workers would be required. The labor market available in Tooele County and other counties within commuting distance is capable of supplying most if not all of these positions.

In addition to jobs, it is expected that construction and operation of the proposed PFSF would result in increased business for the Pony Express Convenience Store on the Reservation and for other businesses and suppliers in the area. Also, there would be a large benefit to the Skull Valley Band in the form of lease payments and employment opportunities for the duration of the proposed PFSF's operation.

6.1.5.4 Impacts of Alternative 4

Because Site B is very close to Site A, there would be no discernible differences in the anticipated impacts to socioeconomic and community resources during construction and operation of the proposed PFSF if it were to be located at Site B. Similarly, the impacts due to construction and operation or use of the ITF and heavy haul transport of SNF along Skull Valley Road would be identical to those described above for the use of Site A with the ITF. Consequently, the combined impacts to socioeconomic and community resources for this alternative are considered similar, if not identical, to those identified for Site A with the ITF.

6.1.6 Cultural Resources

6.1.6.1 Impacts of Alternative 1

The impacts to cultural resources would be small to moderate. Potential impacts at the proposed PFSF site include small impacts to significant cultural resource properties, and require limited mitigation measures. The Cooperating Federal Agencies have determined that activities associated with construction of the Skunk Ridge rail line would adversely affect parts of eight historic properties that have been evaluated as being eligible for inclusion on the *National Register*. These include historic properties 42TO709, 42TO1409, 42TO1410, 42TO1411, 42TO1412, 42TO1413, 42TO1416, and 42TO1417, as identified in the cultural resources Class III (intensive field survey) studies (Birnie and Newsome 2000). Impacts to sections of these sites that lie within the rail right-of-way corridor will be mitigated prior to construction. During construction, temporary barricades will be constructed along the edge of the right-of-way at each historic property to prevent inadvertent loss of integrity to the portions of the properties being preserved outside the rail corridor. Cultural resources at the proposed PFSF project area consist of isolated surface artifacts that are not significant. Cultural resource

mitigation measures for the proposed rail line will be included in the Treatment Plan resulting from the Section 106 consultation process.

6.1.6.2 Impacts of Alternative 2

In this alternative, the rail line is the same alignment as the proposed action and the proposed PFSF location, Site B, is near to Site A. Based on available cultural resources information, Sites A and B are very similar. Therefore, the potential for impacts to cultural resources would be small to moderate.

6.1.6.3 Impacts of Alternative 3

Construction and operation of the proposed PFSF at Site A would have the same potential for impacts as under the proposed action. Historic features present in the vicinity of the proposed ITF include a historic telephone line and the historic Union Pacific Railroad with associated features. An archaeological survey of this location revealed no archaeological resources within the location itself (Birnie and Newsome 2000) (see Section 5.6.1.2). Since no upgrading of the Skull Valley Road is planned, there is no potential for direct impacts to archaeological and historic properties located adjacent to the existing the highway. Therefore, the impacts to cultural resources would be small.

6.1.6.4 Impacts of Alternative 4

Under this alternative, the potential for impacts to cultural resources would be the same as outlined in Section 6.1.6.2 for Site B and the same as Section 6.1.6.3 for the proposed ITF location and the existing Skull Valley Road. Accordingly, the impact to cultural resources for this alternative would be small.

6.1.7 Human Health Impacts

6.1.7.1 Impacts of Alternative 1

Non-radiological impacts. The non-radiological health impacts for the proposed action would be small. The estimates of potentially fatal and nonfatal occupational injuries for construction and operation activities would be small for workers. As shown in Table 6.2, the total estimated number of potential fatalities for the construction and decommissioning of the proposed PFSF and rail line would be less than 1 and nonfatal injuries for construction and decommissioning would be 25 each. Table 6.2 also shows that for normal operations at the proposed PFSF and the rail line, there would be less than 1 expected potential fatality and about 67 nonfatal injuries that involved lost workdays.

Radiological impacts. The radiological impacts from the proposed action are small. The estimates of radiation doses to the general public for operation of the proposed PFSF (see Section 4.7.2.1) and transportation using the Skunk Ridge rail line (see Section 5.7.2) would be small. Operation of the proposed PFSF and transportation of SNF via the Skunk Ridge rail line would result in exposing the general public and workers to small amounts of radiation. None of the estimates of annual radiological dose to members of the public exceed 1 percent of the radiation doses that members of the general public would likely receive from natural background radiation in the United States. The risk from accidents at the proposed PFSF or during transport of the SNF are considered to be small.

Table 6.2. Estimated fatal and nonfatal occupational injuries for the construction, normal operations, and decommissioning activities at the proposed PFSF and the Skunk Ridge rail line

Activity	Estimated potentially fatal injuries	Estimated potentially nonfatal injuries (Alternatives 1, 2)
Construction		
Phase 1	0.027	6.4
Phase 2	0.030	7.1
Phase 3	0.030	7.1
Rail line	0.020	4.8
Construction total	0.11	25.4
Operations ^a		
PFSF	0.18	65.4
Rail line	0.011	1.7
Operations total	0.19	67.1
Decommissioning		
PFSF	0.088	20.6
Rail line	0.020	4.8
Decommissioning total	0.11	25.4

^aOperations are assumed to include 20 years of operations under an initial license and 20 years of operations under a renewed license.

6.1.7.2 Impacts of Alternative 2

Non-radiological impacts. The non-radiological impacts from using Site B with the rail line would be identical to those presented above for the proposed action.

Radiological impacts. The radiological impacts from using Site B with the Skunk Ridge rail line would be indistinguishable from those of the proposed action. While Site B is 800 m (0.5 mile) closer to the nearest residence than Site A, the estimated doses at this location would be small and would be indistinguishable from those at Site A.

6.1.7.3 Impacts of Alternative 3

Non-radiological impacts. The non-radiological impacts of using Site A with the ITF would be small. The estimates for this alternative of potentially fatal and nonfatal occupational injuries for construction, operation, and decommissioning activities would be small for workers. As shown in Table 6.3, the total number of estimated fatalities for construction and decommissioning of the proposed PFSF and ITF

Table 6.3. Estimated fatal and nonfatal occupational injuries for the construction, normal operations, and decommissioning activities at the proposed PFSF and the ITF

Activity	Estimated potentially fatal injuries	Estimated potentially nonfatal injuries (Alternatives 3, 4)
Construction		
Phase 1	0.027	6.4
Phase 2	0.030	7.1
Phase 3	0.030	7.1
ITF	0.005	1.2
Construction total	0.092	21.8
Operations ^a		
PFSF	0.18	65.4
ITF	0.017	5.1
Operations total	0.20	70.5
Decommissioning		
PFSF	0.088	20.6
ITF	0.005	1.2
Decommissioning total	0.093	21.8

^aOperations are assumed to include 20 years of operations under an initial license and 20 years of operations under a renewed license.

would be less than 1 and nonfatal injuries that include lost workdays for the construction and decommissioning would be 21.8 each, respectively. Table 6.3 also shows that there would be less than 1 fatality and about 70.5 nonfatal injuries that include lost workdays total at the proposed PFSF and the ITF for normal operations.

Radiological impacts. The radiological impacts from using Site A with the ITF would be small to moderate. The estimates of radiation doses to the general public for operation of the proposed PFSF (see Section 4.7.2.1) and transportation using the ITF (see Section 5.7.2) would be small. However, without monitoring of doses and careful attention by PFS to protection of workers, this alternative could result in exposing the workers to amounts of radiation in excess of NRC occupational exposure limits. Such a result could occur because workers involved with transporting SNF from railcars to heavy haul vehicles would also perform Category 1 and 2 tasks at the proposed PFSF. The total annual person-rem for these work activities assuming transfer of 200 casks per year is 0.646 person-Sv (64.6 person-rem) [i.e., 0.49 person-Sv (49 person-rem) for unloading casks at the proposed PFSF; 0.037 person-Sv (3.7 person-rem) for maintenance and inspection at the proposed PFSF; 0.119 person-Sv (11.9 person-rem) for handling at the ITF]. Considering that PFS has indicated that only 12 to 15 workers would be involved in these activities, this could result in individual workers receiving 0.053 Sv [5.3 rem] (for 12 workers) to 0.0431 Sv [4.31 rem] (for 15 workers) annually. Therefore, for this alternative, PFS would be required to take additional measures to ensure

that its workers receive no more than 0.05 Sv (5 rem) per year, pursuant to 10 CFR Part 20 limits for occupational exposure.

None of the estimates of annual radiological doses to members of the public exceed a small fraction of 1 percent of the radiation doses members of the general public would likely receive from natural background radiation. The risk from accidents at the proposed PFSF or during transport of the SNF are considered to be small.

6.1.7.4 Impacts of Alternative 4

Non-radiological impacts. The non-radiological impacts from using Site B with the ITF would be identical to those presented above for the use of Site A and the ITF.

Radiological impacts. The radiological impacts from using Site B with the ITF would be indistinguishable from those of using Site A with the ITF. While Site B is approximately 1.6 km (1 mile) further from the ITF and 800 m (0.5 mile) closer to the nearest residence than Site A, the estimated additional doses to the public along the short extra length of Skull Valley Road, as well as the slightly larger dose to the nearest resident, would be small and would be virtually indistinguishable from the doses at Site A.

6.1.8 Other Impacts

6.1.8.1 Noise

Impacts of Alternative 1. Sounds from storage facility construction would not be audible along most of the rail line, and vice-versa, due to the large distances between them. When rail line construction would occur close to the storage facility, noise would not be additive because combined noises are dominated by the loudest source. Several proximate noise sources would not be expected to add more than about 3 decibels to the noise of the loudest source. These concepts also apply to site operation, when the delivery locomotive, switch engine, emergency generator, and a few vehicles might all be operating simultaneously. In this case, the combined noises are unlikely to be more than about 3 dB(A) greater than the loudest source, which would be the diesel switch engine whistle.

Impacts of Alternative 2. Noise impacts of Site B would be difficult to distinguish from Site A with a rail line. Noise from construction would be expected to last about 2 percent longer because the additional construction would be expected to take more time. Also, the delivery locomotive would generate noise over an additional 2 percent distance (and, presumably, for 2 percent more time) each time a delivery is made.

Impacts of Alternative 3. Sounds from construction at the storage facility would not be audible at the ITF facility, and vice-versa, due to the large distance between those sites. In any case, as noted above, noise from proximate sources tends to be dominated by the loudest source. Delivery vehicles would likely dominate the noise at the storage facility, which would otherwise be relatively quiet. An ITF facility would obviate the use of train transport and any noise that might be associated with a rail line. However, SNF heavy-haul vehicles on Skull Valley Road would add noticeable noise which could sometimes be distracting to residents along the route.

Impacts of Alternative 4. Noise impacts of Site B with the ITF would be difficult to distinguish from Site A with an ITF. Heavy-haul vehicles would generate noise over an additional 3 percent distance

(and, presumably, for 3 percent more time) each time a delivery of SNF is made to the proposed PFSF at Site B.

6.1.8.2 Scenic Qualities

Impacts of Alternative 1. Construction and operation of the proposed PFSF at Site A, when combined with construction and operation of the rail line and siding, would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. The NRC staff concludes that changes in the scenic quality of the landscape, primarily due to construction and operation of the proposed PFSF at Site A and the rail line and siding, would represent moderate impacts to recreational viewers, moderate impacts to residents of Skull Valley, and moderate impacts to motorists traveling Skull Valley Road. The staff concludes that the combined visual impact would be moderate because the visual presence of the proposed facilities would alter noticeably the scenic qualities of Skull Valley. The analyses explaining these conclusions are contained in Sections 4.8.2 and 5.8.2.

Impacts of Alternative 2. Construction and operation of the proposed PFSF at Site B, when combined with construction and operation of the rail line and siding, would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. For visual impacts, only a minor difference exists between Site A and Site B in that the new rail line to Site B would have to be 800 m (2,600 feet) longer than the line to Site A. The NRC staff concludes that changes in the scenic quality of the landscape, primarily due to construction and operation of the proposed PFSF at Site B and the rail line and siding, would represent moderate impacts to recreational viewers, moderate impacts to residents of Skull Valley, and moderate impacts to motorists traveling Skull Valley Road. The staff concludes that the combined visual impact would be moderate because the visual presence of the proposed facilities would alter noticeably the scenic qualities of Skull Valley. The analyses explaining these conclusions are contained in Sections 4.8.2 and 5.8.2.

Impacts of Alternative 3. Construction and operation of the proposed PFSF at Site A, when combined with construction and operation of the ITF, would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. The NRC staff concludes that changes in the scenic quality of the landscape, primarily due to construction and operation of the proposed PFSF at Site A and the ITF at Timpie, would represent moderate impacts to recreational viewers, moderate impacts to residents of Skull Valley, and small impacts to motorists traveling Interstate 80. The staff concludes that the combined visual impact would be moderate because the visual presence of the proposed facilities would alter noticeably the scenic qualities of Skull Valley. The analyses explaining these conclusions are contained in Sections 4.8.2 and 5.8.2.

Impacts of Alternative 4. Construction and operation of the proposed PFSF at Site B, when combined with construction and operation of the ITF, would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. The NRC staff concludes that changes in the scenic quality of the landscape, primarily due to construction and operation of the proposed PFSF at Site B and the ITF at Timpie, would represent moderate impacts to recreational viewers, moderate impacts to residents of Skull Valley, and small impacts to motorists traveling Interstate 80. The staff concludes that the combined visual impact would be moderate because the visual presence of the proposed facilities would alter noticeably the scenic qualities of Skull Valley. The analyses explaining these conclusions are contained in Sections 4.8.2 and 5.8.2.

6.1.8.3 Recreation

Impacts of Alternative 1. The combined effects of constructing and operating the proposed PFSF at the preferred site (Site A) and constructing a new rail siding at Skunk Ridge and a new rail corridor connecting the Skunk Ridge siding with Site A and then transporting SNF to Site A by rail on recreational resources and opportunities are expected to be small. Construction and operation of the proposed PFSF and rail line would not prevent access to recreational resources, but these activities are likely to result in some delays or inconvenience to users wishing to access recreational resources and opportunities, particularly during construction, when (1) access to these resources in Skull Valley would be adversely affected by the movement of construction materials and workers on Skull Valley Road (i.e., for construction of the proposed PFSF) and (2) access to resources west of the proposed rail line would be affected by rail line construction. Since access to recreational resources west of the proposed rail line must be made by way of Skull Valley Road, these particular impacts are additive. During the later phases of construction and during the operations period, impacts to recreational resources and opportunities should be smaller (i.e., with much less traffic along Skull Valley Road), although there may continue to be some continuing difficulty in accessing resources west of the proposed rail line. Construction and operations of the proposed PFSF and rail line should result in small indirect impacts to recreational resources and opportunities.

Impacts of Alternative 2. Because Site B is very close to Site A, there would be no discernible differences in the anticipated impacts to recreational resources and opportunities during construction and operation of the proposed PFSF if it were to be located at Site B. Similarly, the impacts due to construction and operation or use of the proposed rail line are identical to those described in Section 6.1.8.3 for the proposed action. Consequently, the combined impacts to socioeconomic and community resources for this alternative are considered similar to those identified for the proposed action.

Impacts of Alternative 3. The combined effects of constructing and operating the proposed PFSF and a ITF near Timpie are expected to be small. The impacts due to construction and operation or use of the ITF and shipment of SNF by heavy-haul tractor trailer along Skull Valley Road to recreational resources and opportunities are expected to be almost non-existent during construction (since the site of the ITF is close to Interstate 80 and is not expected to affect recreational resources) but could result in temporary delays for users traveling along Skull Valley Road to access recreational resources and opportunities in Skull Valley during operations. The combined impacts to recreational resources and opportunities for this alternative are considered to be small during construction and operations.

Impacts of Alternative 4. Because Site B is very close to Site A, there would be no discernible differences in the anticipated impacts to recreational resources and opportunities during construction and operation of the proposed PFSF if it were to be located at Site B. Similarly, the impacts due to construction and operation or use of the ITF and heavy haul transport of SNF along Skull Valley Road are identical to those described above for the use of Site A with the ITF. Consequently, the combined impacts to recreational resources and opportunities for this alternative are considered similar to those identified for Site A with the ITF and would be small.

6.2 Environmental Justice

Executive Order 12898 (59 Fed. Reg. 7629) directs Federal executive agencies to consider environmental justice under NEPA. CEQ has provided *Guidance for Addressing Environmental Justice Under the National Environmental Policy Act* (December 1997). The Executive Order ensures that minority and low-income groups do not bear a disproportionate share of negative environmental consequences. Although NRC is an independent agency, the Commission has committed to undertake environmental justice reviews and has provided specific information requirements in Nuclear Material Safety and Safeguards (NMSS) NUREG-1748, “Environmental Review Guidance for Licensing Actions Associated with NMSS Programs,” September 2001.

This environmental justice review includes an analysis of the human health and environmental impacts on low-income and minority populations resulting from the proposed action and its alternatives. The first step in the review was to analyze demographic data to identify the minority and low-income groups within the area of environmental study. Next, the impacts from the proposed action and its alternatives were evaluated to determine if the impacts disproportionately affected minority and low-income groups in an adverse manner.

For the purposes of this review, “minority” is defined as individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. A minority population is one where the minority population exceeds 50 percent or where the minority population of the environmental impact site is significantly greater than the minority population percentage in the geographic area of study. A “low-income” population is defined as one where the percentage of households below the poverty level in an environmental impact site is significantly greater than the low-income population percentage in the geographic area of study. Under NMSS procedures, as a general matter (and where appropriate), the NRC staff may consider differences greater than 20 percentage points to be significant (NRC/NMSS 1999). NRC policy (NRC/NMSS 1999) states that when determining the area for impact assessment for a facility located outside the city limits or in a rural area, a 6.4-km (4-mile) radius [or 130 km² (50 miles²)] should be used.

Under NMSS procedures, additional census blocks groups may be identified by relaxing these criteria if local circumstances appear to warrant. In the current situation, the State of Utah has very low percentages of minority populations, and rural areas in the State tend to have sparsely-populated large block groups. In addition, the analysis examines transportation routes into the proposed PFSS site. As a result of the proposed action being examined and the local circumstances, the area for impact assessment was expanded to an 80 km (50 miles) radius to examine local transportation routes into the facility. The percentage criterion was left at 20 percentage points; however, the staff also examined a 10 percentage point difference to see if additional relatively small pockets of low income and minority residences could be identified. In addition, the portion of the proposed rail routes beyond the 80 km (50 mile) radius impact assessment area but within the State of Utah were also examined to determine if any minority and low-income populations exist along these routes. It is important to note that the expanded radius does not dilute the environmental justice impact of the facility, since no averaging of environmental effects takes place, but each minority community is evaluated on its own. Neither are the criteria for identifying minority and low-income communities diluted by the wider radius, since the demographic and income characteristics of each block group are individually compared against the state of Utah. Rather, it simply expands the geographic area where additional minority and low income block groups can be (and were) identified.

Usually, a minority population would be one with a minority percentage of 50 percent or a percentage 20 percentage points greater than in the geographic area of study (usually the State and counties that include the environmental impact site) because the percentage of minorities in the county is nearly identical to the percentage of minorities in the State. For example, for the State of Utah, the Native American population is 1.4 percent, and the total minority population is 8.71 percent. Therefore, a census block group within the impact assessment area with a Native American population of at least 21.4 percent or with a minority population of at least 28.7 percent would count as a minority population worthy of further study. A similar analysis is conducted for the low income population.

In some cases, minority and low-income groups may rely on environmental resources for their subsistence and other cultural practices. Therefore, NMSS guidance also specifies that the NRC staff make inquiries regarding special resource uses or dependencies of identified minority and low-income populations, including cultural practices and customs, previous environmental impacts and features of previous and current health and economic status of the identified groups. In some circumstances, these groups might be unusually vulnerable to impacts from the proposed action.

Potential resource dependencies were identified in the course of public meetings and other information supplied by the Skull Valley Band, by Ohngo Gaudadeh Devia (an organization representing part of the Skull Valley Band), and by the Confederated Tribes of the Goshute Reservation, which include members who are relatives of the Skull Valley Band, but reside on another Reservation on the Nevada-Utah border near Wendover, Utah. Also, the Cooperating Agencies sent letters to several local Federally Recognized Indian Tribes describing the proposed construction and operation of the Skunk Ridge rail line, and to solicit their concerns on the project and to inquire about whether they desired to participate in the Section 106 consultation process (see Appendix B). The Confederated Tribes of the Goshute Reservation and the Te-Moak Western Shoshone Indians of Nevada were the only tribes who indicated a continued interest in participating. Inquiries also were made by PFS to the State of Utah concerning the health status of the Skull Valley Band, and the NRC staff made additional inquiries to the Indian Health Service. The results are described below.

6.2.1 Impacts of Alternative 1

The staff examined the geographic distribution of minority and low income populations within 50 miles of the proposed PFSF and along principal rail routes within the State of Utah, based on 1990 U.S. Census data, supplemented by field inquiries by PFS to the local planning departments in Tooele and Salt Lake Counties and social service agencies in the State. The record of public comment was also reviewed to see if any groups were missed.

6.2.1.1 Demographics

Minority populations. The significant minority populations near the proposed PFSF are members of the Skull Valley Band, both on the Reservation and in the nearby town of Grantsville. There is a combined non-Reservation population of about 120 Skull Valley Band members, most of whom reside in outlying communities such as Grantsville and Salt Lake City. The Reservation population is approximately 30 persons, most of whom are Skull Valley Band members; however, some non-members, such as spouses, also live on the Reservation (see Section 3.5.1). Figure 6.1 illustrates the geographic distribution of census block groups meeting the 20 percentage point criterion for minority populations in the 1990 U.S. census within 80 km (50 miles) of the proposed PFSF. In the figure, the block group surrounding the proposed PFSF site (shaded) and 5 block groups in Salt Lake City (shaded and circled, and identified by heavy arrows) meet the 20-percent point criterion. Table 6.4

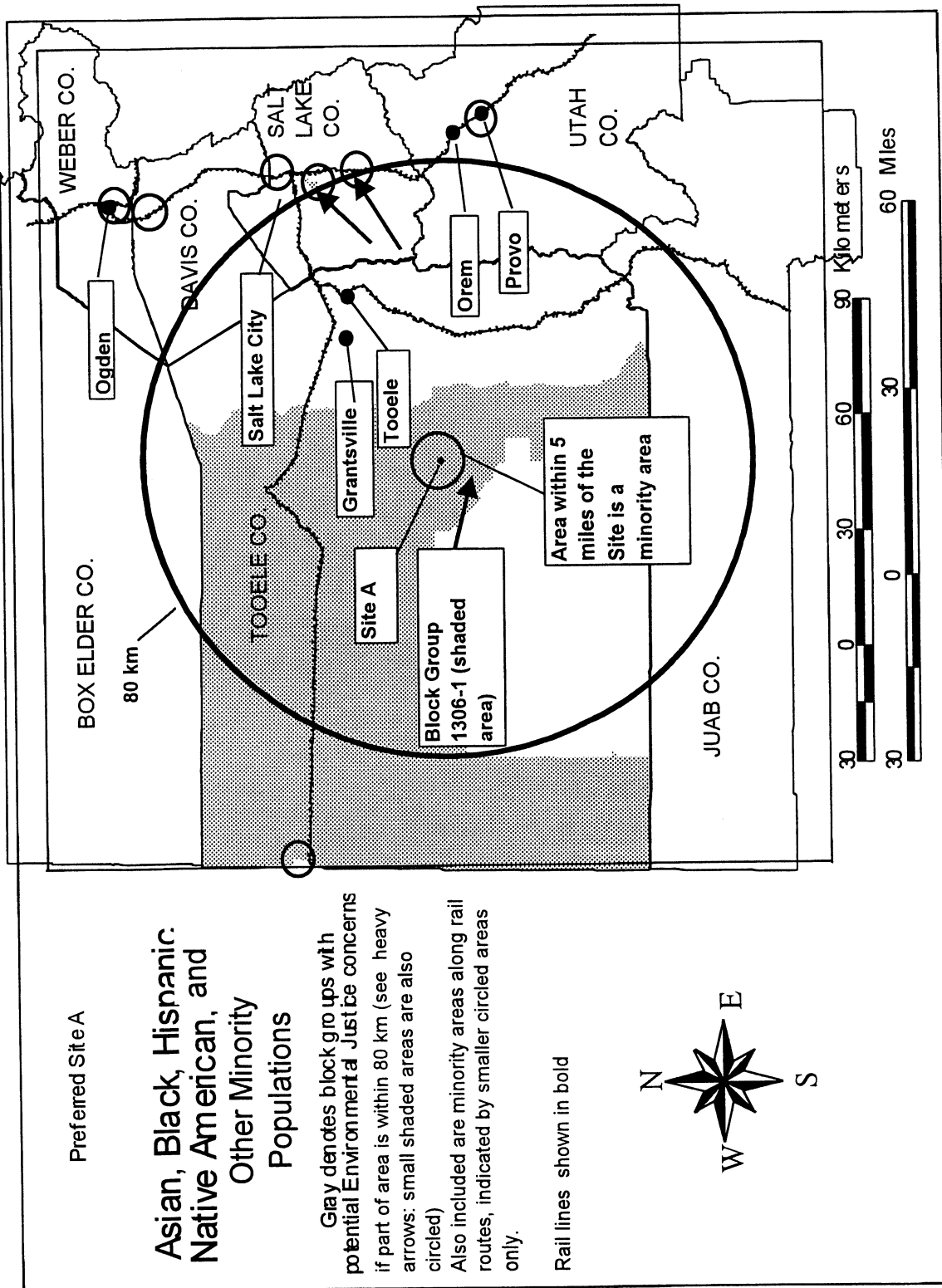


Figure 6.1. Geographic distribution of minority census block groups near the proposed PFSF site in Skull Valley.

Table 6.4. Minority and low income block groups within 80 km (50 miles) of the preferred site
(Boldface entries = 20 percent criterion; italicized entries = 10 percent criterion)

County	Block and tract group	Persons	Below poverty level (percent)	Total whites (percent)	Black (percent)	Native American (percent)	Asian and Pacific Islander (percent)	Other (percent)	Hispanic (all races) (percent)	Minorities (racial minorities plus white hispanics) (percent)
State of Utah		1,722,850	11.4	93.9	0.6	1.4	1.9	2.1	4.8	8.7
Threshold for environmental justice concerns		—	31.4	—	20.6	21.4	21.9	22.1	24.8	28.7
Utah										
0106	1	1,151	19.0	85.8	0.0	1.7	0.3	12.3	16.2	16.7
Tooele										
1306	1	338	15.0	72.8	0.0	23.1	1.8	2.4	6.2	28.2
1310	1	1,390	8.1	94.8	0.4	1.4	0.4	2.9	13.8	20.0
1310	3	797	16.8	89.6	0.8	1.1	1.9	6.6	16.4	20.5
1310	4	898	24.7	86.5	0.3	1.4	0.4	11.2	16.4	18.3
Salt Lake										
1028	4	2,715	16.7	71.1	4.6	1.7	13.6	9.0	17.0	37.7
1116	6	1,200	35.5	91.3	0.8	1.3	3.3	3.2	7.3	10.8
1121	1	784	24.7	94.9	0.3	2.4	1.3	1.1	9.2	21.3
112401	3	613	13.8	68.2	0.3	2.6	2.9	25.9	37.4	50.2
112401	4	1,657	36.3	82.6	0.7	3.2	2.3	11.2	26.0	29.0
112401	5	995	52.0	70.8	1.0	2.9	9.2	16.1	31.9	51.6
112402	3	2,218	15.8	87.4	0.1	0.2	7.8	4.5	10.1	18.9
112801	4	3,311	0.5	82.5	6.6	2.4	1.5	7.0	14.8	25.7
112908	4	1,219	31.8	91.4	0.4	0.5	4.4	3.3	9.8	11.8
112908	5	828	8.6	91.8	0.0	0.2	2.9	5.1	11.7	19.4
1131	5	1,233	24.3	98.3	0.4	0.5	0.1	0.7	2.6	3.5
113304	2	882	32.0	87.9	1.2	1.7	2.3	6.9	12.2	14.1
113304	5	1,778	31.5	84.1	1.3	2.5	7.5	4.6	8.5	21.1
113305	1	1,397	23.1	83.7	3.3	2.3	4.9	5.8	13.1	21.8
113305	3	1,174	53.7	57.4	0.8	10.7	26.0	5.1	7.8	46.5
113306	1	1,855	23.0	85.3	3.3	1.2	5.0	5.2	9.6	20.6
113307	2	1,469	21.9	84.9	0.9	1.6	7.6	5.0	8.2	17.8
113308	1	974	23.6	83.8	1.4	4.0	3.6	7.2	11.9	20.9
113308	3	1,263	25.5	87.6	0.9	3.4	6.1	2.0	9.5	18.2
113405	1	2,763	4.7	81.0	1.0	0.8	13.0	4.2	7.5	22.8
113406	2	1,926	21.2	84.5	0.9	1.8	7.9	4.8	8.7	21.0
113407	2	699	19.6	90.4	0.3	1.0	1.9	6.4	12.4	23.9
113519	4	1,552	23.3	91.3	1.5	1.0	1.3	4.8	10.4	14.2
113802	2	1,476	17.6	93.4	0.8	0.3	2.0	3.5	13.1	19.7
113901	3	1,636	31.7	90.6	0.9	0.4	2.8	5.3	15.6	23.4
Juab										
9732	2	191	20.7	73.8	0.0	18.8	0.0	7.3	7.9	26.2

shows the percentages of the various minority populations for each census block group within 80 km (50 miles) that satisfies the criteria used for this analysis. A table that shows the minority and low-income percentages for each census block group within 80 km (50 miles) of the proposed PFSF is shown in Appendix E. In the table, the census block groups meeting the 20 percentage point criterion are in boldface, and the additional block groups meeting the 10 percentage point criterion are in italics. It should be noted that for this analysis, the State was used as the area of geographic study. Therefore, the minority and low-income populations were based on a comparison to the State averages. The county averages nearest the proposed project (e.g., Tooele, Salt Lake) have minority and low-income populations similar to the State of Utah. Relaxing the criteria would expand the number of block groups counted as minority block groups within 80 km (50 miles) from 6 to 18, but would not significantly change the picture of their location. These additional block groups tend to be near those in Salt Lake City already identified using the 20-percentage point criterion. Most of Skull Valley is in a single block group (Tract 1306, Block Group 1), and it is the only block group within about 6 km (4 miles) of the proposed PFSF facility.¹ It is a minority block group.

There is a small Native American population in north-central Salt Lake City. A few block groups in the north and central parts of Salt Lake City, in the central Ogden area and between Ogden and Salt Lake City in the general vicinity of Clinton, West Point, and Clear Field, are near the proposed rail routes and met the criteria used for this analysis to determine a minority population.

Hispanics are Tooele County's principal minority group, with 2960 individuals. There is a Hispanic community in Tooele that does not rise to the 20 percent criterion used for this analysis to determine a minority population (Tract 1310 has three block groups in which the number of Hispanics as a percent of population exceeds that for the state as a whole by 10 percent or more). Hispanic populations in west and northwest Salt Lake City satisfy the 20 percent criterion. In north Salt Lake County beyond 80 km (50 miles) from the proposed PFSF, there are about a dozen block groups that satisfy the minority and low income criteria and are near the principal rail route. Also, there are concentrations of Hispanics and other minorities in Davis and Weber Counties beyond 80 km (50 miles) from the proposed PFSF site. Weber County (Ogden and vicinity) has several block groups that have majority or near-majority Hispanic populations. In some cases, these block groups appear to be within a mile of the main rail corridors to the proposed PFSF site. All of these minority block groups are indicated by the open circles in Figure 6.1.

Beyond 80 km (50 miles) from the proposed PFSF, one block group in Davis County showed almost 27 percent black (76 percent minorities), and two in Salt Lake County and one in Davis county were over 25 percent Asian. These communities are near the proposed rail routes. No other significant minority populations were identified in any census block group either close to the proposed PFSF site or along the proposed transportation corridors into the site. This indicates that other minority populations are either well-mixed into the majority population, or other minority populations are too small to be captured in the census detail.

In summary, 6 block groups within 80 km (50 miles) of the proposed PFSF were identified to satisfy the criteria used in this analysis to define a minority population. The minority population nearest to the proposed site is the Skull Valley Band living on the Reservation. As a result, the impacts on this group were analyzed to determine if a disproportionate high and adverse impact would occur from construction and operation of the proposed PFSF.

¹PFS indicates that about 83 percent of persons living within 5 miles of the preferred site are minorities (PFS/ER 2001).

Six minority block groups within 80 km (50 miles) of the proposed PFSF and 45 minority block groups within the State of Utah, but beyond 80 km (50 miles) from the proposed PFSF site were identified to live near the proposed transportation routes (i.e., rail routes). Because minority and low income populations living near these rail routes would likely have more SNF shipments pass them, the impacts to these populations were analyzed to determine if a disproportionate high and adverse impact occurred from the transportation of SNF to the proposed PFSF.

Low-income populations. Figure 6.2 shows the distribution of low-income populations for several counties in the State of Utah, and includes the environmental study area out to 80 km (50 miles) from the proposed PFSF site. The figure identifies (by the use of heavy arrows and shading) the general location of 8 block groups meeting the 20 percentage point criterion. Detailed information on individual block groups within 80 km (50 miles) that satisfy the criteria used for this analysis is shown in Table 6.4 (block groups that meet the 20 percentage point criterion are in boldface and those meeting the 10 percentage point sensitivity criterion are in italics). Neither the Skull Valley block group nor Tooele County as a whole would be identified as a low-income population by the NMSS criteria. Of the 320 persons in the Skull Valley block group, only 15 were counted as below the poverty line in 1990. Recent inquiries by PFS indicate that this number may now be “about 17.” These may disproportionately include residents of the Reservation, but the census data do not provide this information (see Section 3.5.1). PFS indicates that over 61 percent of the people within 5 miles of the preferred site (Site A) are low-income (PFS/ER 2001). The concentration of low-income populations is slightly elevated in Grantsville, Tooele, and south/southeast Tooele County but does not satisfy the 20 percentage point criterion used for this analysis. The main low-income areas within 80 km (50 miles) of the proposed PFSF are located, as shown in Figure 6.2 by the open circles, in central and northern Salt Lake County, within a mile or two of the principal rail corridor. Beyond 80 km (50 miles) of the proposed PFSF, the principal low-income areas appear to correspond closely with the minority communities in Weber (Ogden) and in Salt Lake and Davis Counties near the rail line. In addition, there are a few non-minority low-income block groups near the rail line in the Provo-Orem area, which may, in part, reflect the presence of the student population of Brigham Young University. In summary, the nearest low-income groups in the region include populations within 6.4 km (4 miles) of the site, including individuals living on the Reservation, as well as populations in Grantsville, Tooele, the south/southeast portion of Tooele County, and near the rail line.

6.2.1.2 Assessment of Impacts

For each of the areas of technical analysis presented in this FEIS, a review of impacts to the human and natural environment was conducted to determine if any minority populations or low-income populations could be subject to disproportionately high and adverse impacts from the proposed action. The review includes potential impacts from the construction and operation of the proposed PFSF and the Skunk Ridge rail line.

Through the scoping process, affected members of the Skull Valley Band and neighboring Indian Tribes expressed their concerns with the project and identified how they perceived that the construction and operation of the proposed PFSF and Skunk Ridge rail line would affect them. These discussions elicited a concern that adverse impacts to the portion of the Reservation that would be used for the proposed PFSF, and nearby tribal trust and BLM lands could also affect the cultural values of the Skull Valley Band and other Native Americans. The impacts identified involved disturbance, destruction, or limitations of services from ecological and biological resources, altered

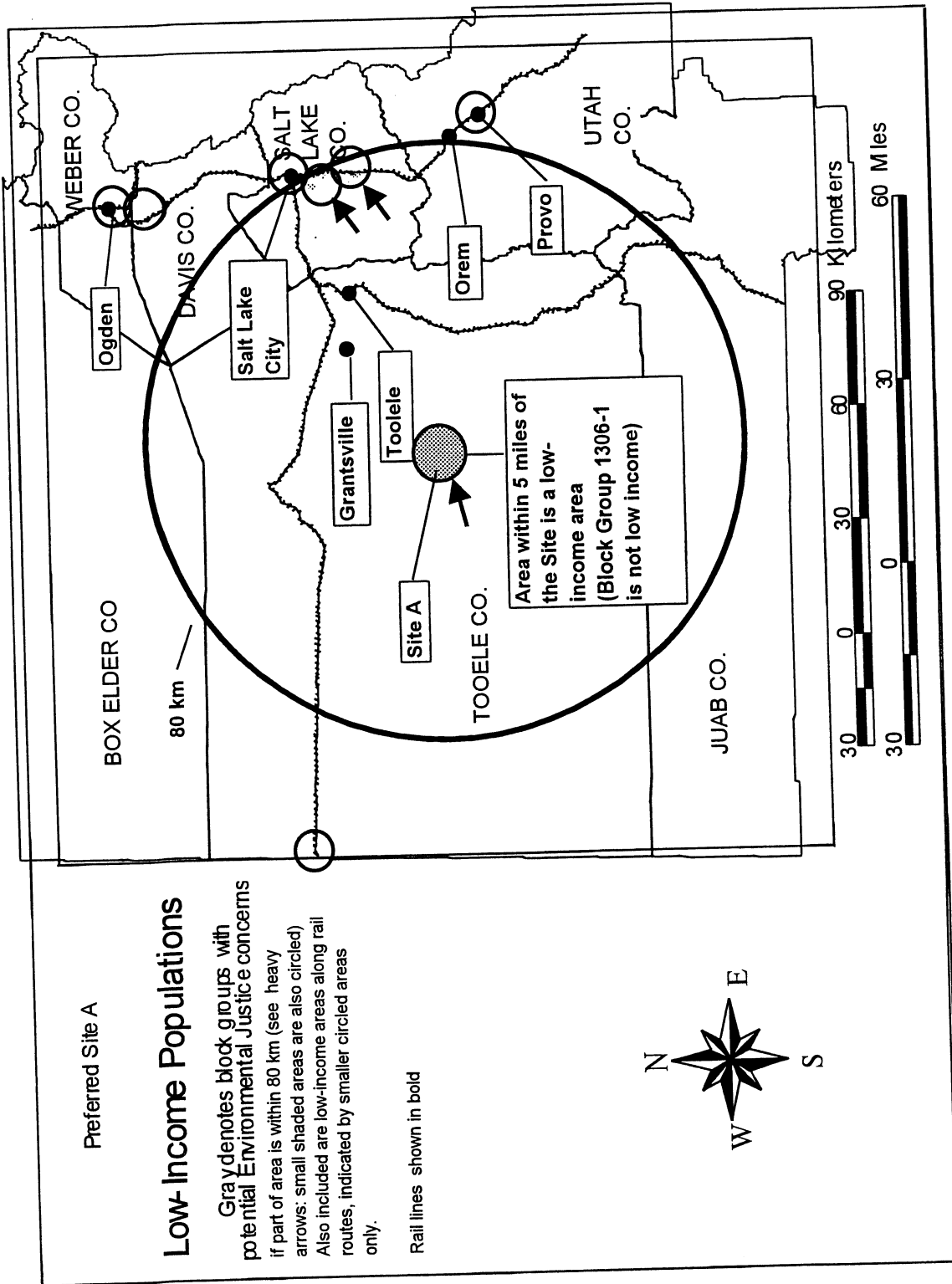


Figure 6.2. Geographic distribution of low-income census block groups near the proposed PFSF site in Skull Valley.

land forms; and a noise or visual impact to sacred sites. The level of impact to cultural values associated with natural resources would be dependent on the cultural values associated with the land disturbed under each of the alternatives. Specific concerns are as follows:

- Potential loss of property values for houses owned by Tribal members
- Potential groundwater conflicts with wells supplying water to Tribal members
- Potential loss of opportunity to collect, or potential airborne or waterborne contamination of, plant and animal resources near the proposed PFSF site (no plant and animal resources appear to be collected on the land that would be inside the proposed PFSF outer fence)
- Potential contamination (probably airborne, given the locations involved) of sacred burial sites within 0.8 km (0.5 mile) of the Skull Valley Band village.

For each area of analyses, impacts were reviewed to determine if any potential adverse impacts to the surrounding population would occur because of SNF transport, construction, normal operations, or accident conditions. If potential adverse impacts were identified, a determination was made as to whether minority or low-income populations would be disproportionately affected. Table 6.5 presents a summary of the potential impacts to low-income and minority populations, without considering any mitigation actions.

Adverse impacts are defined as negative changes to the existing conditions in the physical environment (e.g., land, air, water, wildlife, vegetation, human health, etc.) or negative socioeconomic changes. Disproportionate impacts are defined as impacts that may affect minority or low-income populations at levels appreciably greater than effects on non-minority or non-low-income populations. As discussed below, the Cooperating Agencies conclude that no disproportionately high and adverse impacts will occur to the Skull Valley Band or to minority and low income populations living near the proposed rail routes from the proposed action.

Impacts to the geology, minerals, soils; water resources; air quality; and ecology from the proposed action. Land distances and changes to land forms could result from such activities as the construction of roads and buildings at the proposed PFSF site. Fugitive dust emissions from such activities, if not properly controlled, may also be an issue at the nearest residences, which are Skull Valley Band-owned. These impacts are most likely to occur where most construction activity is likely to take place, in and around the proposed PFSF site and along the rail corridor into the site. The impacts are most likely to be seen from Skull Valley Road, Hickman Knolls, the Stansbury Mountains to the east of the site, and the Cedar Mountains to the west of the proposed PFSF. Some of these locations are sacred sites of the Skull Valley Band. Noise and dust associated with the construction and operation of the proposed PFSF are not expected to affect the nearest residents (Section 4.8), would only slightly and temporarily affect wildlife (Section 4.4), and would likely have small, if any, potential to impact the Stansbury Mountains, Cedar Mountains, or Hickman Knolls. Vegetation and wildlife are expected to be affected only within the 330 ha (820 acre) OCA, the access road, and rail corridor. The impacts to these areas are not expected to be significant (see Sections 4.4 and 5.4). As described in Sections 4.8.2, 5.8.2, and 6.1.8.2, the scenic qualities to members of the Skull Valley Band could be moderately impacted. Mitigation measures are described in Section 4.8.2. A significant increase in traffic on Skull Valley Road would occur during the initial phase of construction (see Section 4.5). This period of inconvenience would be short. Although traffic would increase, all travelers on Skull Valley Road including those workers traveling to Dugway would be affected.

Table 6.5. Potential impacts of the proposed action on minority and low-income populations

Potential impact ^a	Potentially affected minority population or low income community	Level of impact
Geology, minerals, and soils	Skull Valley Band	Small
Water Resources	Skull Valley Band	Small
Air quality	Skull Valley Band	Small
Ecology	Skull Valley Band	Small
Socioeconomic and community resources	Skull Valley Band	Small to moderate (but beneficial)
Land use		
Employment		
Population		
Housing values		
Economic structure	Skull Valley Band; other Federally Recognized Indian Tribes	Moderate to large (and beneficial)
Cultural resources	Skull Valley Band	Small to moderate
Human health	Skull Valley Band, low-income and minority populations near proposed rail routes	Small
Radiological		
Non-radiological		
Noise	Skull Valley Band	Small to moderate
Scenic qualities	Skull Valley Band	Moderate
Recreation	Skull Valley Band	Small

^aAll other potential impacts were small and not disproportionate.

Therefore, the proposed action would not result in a disproportionate impact to minority and low income groups in the area. There are expected to be no groundwater conflicts between the site and the nearest well that belongs to a member of the Skull Valley Band (Section 4.2.1.2). If there is a groundwater conflict, groundwater likely can be obtained from the Reservation supply (which could be upgraded at the same time if necessary), or from wells that could be drilled east of the site in a location where no conflict occurs. Water drawdown conflicts in any case are far more likely down gradient with private, non-minority-owned wells than they are with on-Reservation wells, which are up-gradient.

Human health impacts at the proposed PFSF. Although minority and possibly low-income populations live relatively near the proposed PFSF site [i.e., within a 5-km (3-mile) radius], including the nearest residence, which is within 3.2 km (2 miles) of the proposed PFSF, it is very unlikely that

normal operations would affect them with radiological and non-radiological health impacts and other risks. Even though the nearest resident populations are Goshutes, these risks would most likely be insignificant for any offsite population for any alternative discussed in this FEIS (see Section 4.7). Inquiries by PFS and the NRC staff to the Skull Valley Band, State of Utah, and Indian Health Service found no activities, resource dependencies, pre-existing health conditions, or health service availability issues that would cause a health impact from normal operations at the proposed PFSF on the members of the Skull Valley Band, either as an individual facility or when combined with the impacts of other nearby facilities. Therefore, it is unlikely that any minority or low-income population would be disproportionately and adversely affected by normal operations of the proposed PFSF.

No credible accident scenarios for the proposed PFSF could be found with potentially significant releases of radionuclides to air or ground that could result in significant effects to any offsite populations. Thus, there is no mechanism for disproportionate environmental effects through accidents on minority residents near the proposed PFSF. Section 4.7 shows that even the most severe hypothetical accident analyzed, which is not credible (i.e., an undetected leak lasting 30 days) would result in exposure of 0.76 mSv (76 mrem) at the nearest offsite boundary. Such an exposure is over 60 times less than the 0.05 Sv (5 rem) exposure limit for accidents in 10 CFR 72.106. An exposure of 0.76 mSv (76 mrem), which is 25 percent of natural background radiation, is not considered a high and adverse impact.

Human health impacts from transportation. Based on their location with respect to rail routes through the Salt Lake City and Grantsville areas, some minority and low-income populations existing along the rail lines could be affected by radiological exposure due to either routine operations or accidents during transportation of SNF to the proposed PFSF (if such accidents took place on the rail route at these locations and if such accidents resulted in significant releases of radionuclides). However, the transportation analysis (Section 5.7) found that the impacts of transporting SNF to the proposed PFSF would be very small from normal operations or from accidents to the general public. Thus, no disproportionately high and adverse effects are expected for any particular segment of the population, including minority and low-income populations that may exist along the proposed rail routes.

Socioeconomic impacts. In addition to the socioeconomic impacts discussed in Section 4.5, three additional areas were identified during the scoping process that could adversely and potentially disproportionately impact minority and Native American populations or low-income populations. These impacts include (1) potential increases or decreases in housing values that could adversely impact access to affordable housing by low-income populations; (2) continued restrictions on access to the proposed PFSF site by all individuals;² and (3) reduction in the services which the proposed PFSF site provides Native Americans. These types of impacts are addressed in the following paragraphs.

Impacts of housing costs on low-income populations. Current projections (Section 3.5) show that housing prices in Skull Valley and nearby towns are expected to increase steadily from 1997 through 2040 under baseline conditions. Housing prices in Tooele County are expected to increase in part because, as the Salt Lake Valley population increases, Tooele and Grantsville populations and the local workforce with it are expected to continue to increase as well. The baseline conditions used in the impact analysis of the alternatives on the housing market in Tooele County did not assume any

²Note that access restrictions would apply to both the Skull Valley Band and to members of the Confederated Tribes of the Goshute Indians, some of whom have expressed an interest in access to and unrestricted use of the Reservation. The impacts have been estimated as small, and no mitigation is planned.

increase in low-income housing or rental units or housing cost subsidies and assistance by Federal, State, or local low-income housing agencies or programs. Changes from these baseline conditions or other substantial changes in the Tooele County economy could modify the net impact of the alternatives on the housing market. If the housing market in Tooele County does not experience the levels of price increases shown in the FEIS, the impact on low-income communities would be correspondingly reduced.

As set forth in Section 4.5, the population in Tooele County is expected to grow, due to the proposed PFSF workforce, by fewer than 100 persons (47 households) who are not members of the Skull Valley Band. Most of these persons are expected to live at Grantsville or Tooele and not on the Reservation. Associated population increases would be minimal, and increased demand for housing over and above the existing demand would be small. The proposed PFSF in and of itself would have minor impacts on housing prices off the Reservation and, when added to the other regional employment impacts, would not adversely impact the access of low-income populations in Grantsville and Tooele to affordable housing.

The Skull Valley housing market is isolated by geography, and part of the valley is also isolated by its Reservation status from the rest of Tooele County. The Reservation itself is not a normal housing market. The housing market on the Reservation has the following unique characteristics. Any housing built or placed on the Reservation may be owned only by members of the Skull Valley Band. A Band member seeking to build or place housing on the Reservation must obtain approval from the Skull Valley Band General Council. Any transfer of ownership of a housing structure or a building on the Reservation must also be approved by the Council. The only persons who may reside on the Reservation itself are Tribal members, spouses of Tribal members, and their children. In addition, the values of existing houses do not include the value of underlying land, which remains in trust for the Skull Valley Band and cannot be owned by any individual Band member or any person outside the Band. Housing prices also reflect the strong presence of Federal housing programs. It is not clear whether there is an active housing market on the Reservation.

Impacts on Reservation housing prices would partly depend on whether the proposed PFSF would attract Tribal members back to the Reservation and partly on the financing mechanisms used to construct housing. If some Skull Valley Band members moved back to the Reservation to take jobs at the proposed PFSF, there might be some increase in demand for housing on the Reservation, but whether returning residents simply build new housing, with no effect on the nominal value of existing homes is not known. In any case, due to the small number of workers expected to move back to the Reservation, the impact on housing prices is expected to be small. Similarly, it is not anticipated that the presence of the facility would deter Tribal members from moving back to the Reservation, and thereby potentially depress housing prices. It is equally likely that members would move back to be near employment opportunities, as is the case with, for example, nuclear power plant workers. These workers are likely to be more concerned with the ease of commuting to work, rather than potential adverse environmental impacts of the proposed PFSF.

In summary, given the above characteristics of the housing market on the Reservation, and the small number of workers expected to move back to the Reservation, the proposed PFSF project would likely have only a small effect on the housing market on the Reservation.

Impacts from restrictions on access to Reservation lands and the transportation corridor.

Access to the proposed PFSF site would be restricted once construction begins. Also, land use would change along the preferred transportation corridor through the BLM lands to the north and west of the

site, possibly preempting some traditional land uses. Some members of the Skull Valley Band have expressed a desire to have access to and use of the Tribal lands in the vicinity of the proposed PFSF now and in the future.

The area of restriction that would result from the construction and operation of the proposed PFSF and rail line are relatively small in size when compared to the overall size of the Reservation and the rest of Skull Valley, and these areas do not contain any known features that are unique to Skull Valley. Access to the rail line would be limited only for areas under construction. Furthermore, only one cultural artifact has been identified in the proposed areas of restriction (see Section 5.6). Therefore, impacts from restricted-access to the proposed PFSF site and any restriction associated with access to the rail corridor is considered to be small. The impacts on access to traditionally used lands and resources are expected to be small, and mitigation is not planned. Restrictions on land access to the west of the rail line could be mitigated by grade crossings, as noted in Section 5.5.

Positive socioeconomic impacts. The proposed PFSF would provide substantial lease income to the Skull Valley Band and would result in a large positive impact. In addition, the lease requires PFS to provide employment preferences first to members of the Skull Valley Band, second to children of Skull Valley Band members, and third to members of other Federally Recognized Indian Tribes. The preferences would be for all positions including skilled technical and management positions, and only to the extent they are in compliance with Federal law. These impacts would be disproportionately beneficial to the Skull Valley Band and other Native Americans.

Cultural resource impacts. Some Skull Valley Band members state that portions of the area near the proposed PFSF site have been used by Native Americans for religious purposes, hunting, and gathering of foods (e.g., deer, wild plants, sage hens, pheasants) and other plant material such as sagebrush and willows. In the scoping meeting, members of the Skull Valley Band stated that the surrounding territory near the proposed PFSF site and the Skunk Ridge rail corridor have been used to gather plants that figure prominently in the traditional practices and religion of the Native Americans. It is quite possible that these resource services which the site provides to the Native Americans could be diminished under proposed action but these resource services are not unique to these areas of Skull Valley and are readily accessible and easily obtainable in the immediate surrounding areas. The Tribal Chairman has indicated that culturally important natural resources are both scarce in the project area and inferior to the same plants in the Cedar Mountains and Tooele Valley (Section 4.6.3). Therefore, the cultural resource impacts are expected to be small.

6.2.2 Impacts of Alternative 2

Because of the close proximity of the two Skull Valley alternatives and similarities between the two sites (they are less than a mile apart, and both are on the Reservation), there is no significant difference in the impacts between Skull Valley Sites A and B from an environmental (Sections 4.1 through 4.4, 4.7), socioeconomic (Section 4.5), cultural (Section 4.6), or an environmental justice perspective. Site B would require an additional 800 m (2,600 ft) linear distance and 9.7 ha (24 acres) for the proposed rail line. This additional land would not result in any significantly different environmental justice impacts from those described for the rail line in Section 6.2.1. Therefore, the environmental justice impacts from this alternative would be nearly identical to those described above for the proposed action.

6.2.3 Impacts of Alternative 3

The construction and operation of the proposed PFSF at Site A and the ITF would potentially affect the same minority and low-income populations identified in Section 6.2.1. The environmental justice impacts from the construction and operation of the site would be the same as those described in Section 6.2.1. The area for the proposed ITF has not been identified by any groups as an area used for hunting or gathering or holding any cultural significance for any Native Americans or other minority or low-income populations. The operation of the ITF would have adverse radiological and non-radiological impacts to individuals using Skull Valley Road (see Sections 5.5 and 5.7). However, these impacts are considered to be small and would affect all users of Skull Valley Road. Therefore, no disproportionately high and adverse impacts would occur from this alternative.

6.2.4 Impact of Alternative 4

Because of the close proximity of the two Skull Valley alternatives and the other similarities between the two sites (they are less than a mile apart, and both are on the Reservation), there is no significant difference in the impacts between Skull Valley Sites A and B from an environmental (Sections 4.1 through 4.4, 4.7), socioeconomic (Section 4.5), cultural (Section 4.6), or environmental justice perspective. Therefore, the environmental justice impacts from this alternative would be nearly identical to those described above for Site A with the ITF.

6.3 Cumulative Impacts

The cumulative impacts of the proposed action are presented and discussed in this section. The impacts of the proposed action, as described in Section 6.1, are combined with other past, present, and reasonably foreseeable actions, including, where appropriate, the presence of other industrial facilities in the region (see Figure 1.1), to determine whether cumulative impacts exist. Very little development has occurred in Skull Valley, and from the information provided in Tooele County planning documents, PFS reports (PFS/ER 2001) that no new private projects are planned for Skull Valley.

6.3.1 Geology, Minerals, and Soils

Cumulative impacts of construction and operation of the proposed PFSF in Skull Valley with other proposed construction projects in the area involve the competition for and use of aggregate, crushed rock, and other mineral resources. Because there are no planned projects in Skull Valley and because of the abundance of these materials in the area, the potential for adverse cumulative impacts to geological resources is considered to be small.

6.3.2 Water Resources

Surface water. Cumulative hydrologic impacts of the proposed action are expected to be small. Some minor impacts would likely occur to surface water channels as a result of construction and operation of the proposed PFSF and access routes. Such impacts would be comparable to or less than the effects observed along existing transportation routes such as existing railroads, Skull Valley Road, and other highways. Mitigation measures that would be implemented as part of construction

and operational BMPs would result in less impact from the proposed new facilities than are observed in older transportation infrastructure.

Groundwater. Most of the water used for construction of the proposed PFSF and its associated access routes would be purchased from offsite sources and transported to the points of use. There are no known plans for other projects that would require withdrawal of groundwater that, if implemented in addition to the PFSF, would potentially cause an adverse impact on groundwater availability in Skull Valley. No adverse hydrologic impact would result from obtaining water offsite to support construction in Skull Valley. Onsite water use would require less than about 40 L/min (10 gal/min) of groundwater withdrawal from the aquifer in Skull Valley. Groundwater in Skull Valley has been used historically for domestic and agricultural purposes and some wells yield up to 225 L/min (60 gal/min) of flow. These uses are expected to continue at the same rates of withdrawal that have occurred for the past several decades. The planned groundwater withdrawals for the proposed PFSF are not expected to adversely impact other groundwater users in Skull Valley during construction and operation or after decommissioning of the site. Prior to initiating construction, PFS would develop a monitoring program (as a mitigation measure; see Condition 5B in Section 9.4.2) to determine if the wells nearest the proposed PFSF are adversely impacted by groundwater withdrawals. If nearby groundwater users are adversely impacted, an alternative water supply could be used.

6.3.3 Air Quality

Cumulative air quality impacts have been obtained by including existing emissions sources and background pollutant concentrations in the analyses presented in Sections 4.3.1 and 5.3. These cumulative impacts are considered to be small; hence, no further evaluation of cumulative impacts is necessary.

No other large construction projects are planned for the Reservation or the immediately surrounding area during the most intense period of construction (Phase 1) of the proposed PFSF, and no other appreciable sources of air pollution in the area appear to be “reasonably foreseeable” during that period. Subsequent phases of construction would produce much less fugitive dust than would Phase 1. The computer-modeled concentrations of air pollutants included the effects of several additional large local sources that may appreciably influence concentrations near the proposed PFSF site, but might have relatively little influence on monitored concentrations at distant sites. These additional sources include Dugway Proving Ground and MagCorp at Rowley, as well as several smaller sources (e.g., Tooele Army Depot).

The largest contribution of the combined off-site sources to the modeled 24-hour PM-10 concentration expected on *any* day at *any* location within 10 km (6 miles) from the construction site is $10 \mu\text{g}/\text{m}^3$, at the receptor nearest to Dugway Proving Ground (i.e., the receptor farthest from the construction area in that direction). At that location, the maximum effects of site construction on 24-hour average PM-10 concentrations would be about equal to the maximum effects from Dugway Proving Ground. However, the maximum effects of site construction at that receptor would occur when the wind is from the north, when PM-10 from the Dugway Proving Ground would be transported southward, away from that receptor. Therefore, these impacts would not be additive or cumulative. No NAAQS for particulate matter would be exceeded or closely approached, and cumulative impacts would be small.

As described in Section 5.3, rail line construction could occasionally produce moderate cumulative impacts to PM-10 levels on Interstate 80 due to the proximity of the construction site to the interstate.

Mitigation measures have been identified in Section 5.3.4 that would reduce the amounts of fugitive dust emitted from the rail line and rail siding construction areas.

6.3.4 Ecological Resources

There are no current, proposed, or reasonably foreseeable future projects that would have any cumulative impacts on vegetation, wildlife, or perennial/ephemeral streams, or aquatic resources related to the proposed PFSF. Therefore, the remainder of this section limits the discussion of cumulative impacts of potential future actions on ecological resources to consideration of the proposed PFSF project.

Vegetation. Constructing and operating the facility as proposed at Site A with the preferred transportation alternative of the new rail line would include clearing existing vegetation within Skull Valley. The OCA for the proposed PFSF would include about 330 ha (820 acres), and an additional 82 ha (202 acres) would be used for the access road right-of-way. Of this total area, only 94 ha (232 acres) would be cleared. About 57 ha (140 acres) of that area would remain cleared for the life of the facility, a 28-ha (68-acre) fire barrier would be planted with crested wheatgrass, and the remaining cleared area [about 10 ha (24 acres)] would be planted with native vegetation following construction.

Construction of the new rail line would require clearing vegetation and grading soil from a total of 314 ha (776 acres) to reach the preferred site (Site A). For this option, approximately 63 ha (155 acres) of desert shrub/grass vegetation would remain cleared for the life of the PFSF, and the remaining cleared area [251 ha (621 acres)] would be replanted with primarily native vegetation following construction.

Thus, the total land cleared for the project as proposed, including the Skunk Ridge rail corridor to Site A, would be 408 ha (1,008 acres), less than 0.4 percent of the land area of Skull Valley. Of the area cleared, only 120 ha (295 acres), about 0.1 percent of the land area of Skull Valley, would remain cleared for the life of the project; the rest would be revegetated with native plants or, in the fire barrier area, planted with crested wheatgrass. The maximum area affected by the project under this alternative would be about 730 ha (1,800 acres) for the OCA, the access road, and the area cleared for the rail corridor. This amounts to less than 0.7 percent of the area of Skull Valley.

Past activities have had a large impact on native vegetation in Skull Valley. The valley consists of approximately 108,400 ha (271,000 acres) of primarily undeveloped, but relatively disturbed land (see Section 3.4.). Little definitive information is available on its original vegetation. Historical ecological studies, based primarily on anecdotal accounts of early travelers, settlers, and explorers, have shown, however, that marked changes have occurred in the native vegetation of Utah valleys since settlement (Christensen and Hutchinson 1965). Significant vegetation changes occurred from 1859 to 1961 in the Cedar, Rush, and Skull valleys of the Bonneville Basin of Utah (Cottam 1961a and 1961b, as cited in Christensen and Hutchinson 1965). Within twenty years of settlement the original desert grasses had been largely replaced by shrubs such as big sagebrush and shadscale. Following those initial changes, junipers began invading those shrub communities. Today, except for vast areas dominated by the recently introduced annual cheatgrass, grass is rarely conspicuous as a dominant in any of these habitats. Much of the original change in vegetation from grass to shrubs is attributed to overgrazing (Christensen and Hutchinson 1965). Wildfires in conjunction with unrestricted livestock grazing were likely required for the conversion of areas to dominance by weedy annuals like cheatgrass (BLM 1988a, 1988b, 1990; Sparks et al. 1990).

The native vegetation in Skull Valley has already been substantially altered by past actions; hence, significant cumulative impacts on native vegetation have already occurred. However, the proposed project would provide only a small, incremental contribution to the existing impacts on native vegetation resulting from the historical impacts of overgrazing and wildfires. In addition, by incorporating measures to revegetate some disturbed construction areas with native species, the proposed project would minimize the overall impact to vegetation in Skull Valley and would provide a small positive benefit.

Wildlife. The maximum area affected by the project could be about 730 ha (1,800 acres). While the construction of the rail line and the fencing of the proposed PFSF could contribute to habitat (or ecosystem) fragmentation, the impacts are expected to be small because (1) the loss of habitat represents less than 0.6 percent of the habitat available in Skull Valley, (2) no wildlife species exclusively use only one portion of Skull Valley, and (3) there are no distinct migration or seasonal use patterns for the wildlife in Skull Valley. With no new developments planned for the foreseeable future in Skull Valley, cumulative impacts to wildlife are expected to be small.

Perennial/ephemeral streams and aquatic resources. Because there are only a few existing facilities in Skull Valley and there are no other major facilities planned, cumulative impacts on aquatic resources would be limited to those identified for this proposed action, which are small.

Wetlands. In general, wetlands in Tooele County are in poor condition because of heavy use by livestock, wildlife, and recreationists (BLM 1983). In order to improve the condition of wetlands in northern Skull Valley, BLM prepared the Horseshoe Springs HMP (BLM 1992a). Implementation of this HMP is protecting wetlands and improving their condition. As the proposed action would have only a small impact on wetlands, it would not add cumulative impacts to wetlands in the valley.

Threatened, endangered, and other species of special concern. Wildfires or inadvertent trampling in Skull Valley are the future activities most likely to impact Pohl's milkvetch, the only plant of special concern in the valley (see Section 4.4.2). Pohl's milkvetch has been threatened by past wildland fires and cheatgrass expansions within the greasewood communities in Skull Valley (BLM 1998c). In particular, future human activity near Hickman Knolls (where Pohl's milkvetch has been found) or on land south of the Reservation (where Pohl's milkvetch is more common) would have the potential for small impacts (Kass 1998a) to this plant species. The potential exists for suitable habitat in Skull Valley for this species to be burned or damaged by wildfires. The loss of more of the greasewood community would reduce the moisture, shade, and shelter needed by the plants. However, if wildfires are suppressed near the proposed PFSF or along the rail line, there would be a small cumulative impact on this species.

Because the size of the proposed project is very small when compared to the size of Skull Valley, the cumulative impacts upon Federally and State-listed wildlife species are expected to be small.

6.3.5 Socioeconomics and Community Resources

There are no known or planned activities in Skull Valley that could produce additional impacts to socioeconomic and community resources near the proposed PFSF site. However, both of the local transportation routes (i.e., from Skunk Ridge and Timpie) involve rail transfer points located in areas that may be used in the future for similar expansion (e.g., for other waste management activities in Tooele County's Interstate 80 Planning District). Given that the residential and infrastructure options for employees at the proposed PFSF site are similar to those for all other activities in Tooele County

(i.e., live in and commute from Rush Valley or Tooele Valley), the potential for cumulative impacts to socioeconomic and community resources does exist, although no such impacts are reasonably foreseeable at this time.

6.3.6 Cultural Resources

The construction and operation of the proposed PFSF, including transportation aspects, at Skull Valley will create a moderate impact to one resource [namely, the “Hastings Cutoff” of the California National Historic Trail (42TO709)], which is eligible for listing on the *National Register*, and only minor adverse impacts to the other seven resources, primarily due to the low number of known resources in the proposed project areas (see Sections 4.6 and 5.6). There are no other proposed actions in the area that would induce a cumulative impact on cultural resources in Skull Valley. Therefore, the staff finds that the cumulative impact to cultural resources is of small significance based on the low number of resource properties affected, and the availability of accepted mitigation measures to reduce the severity of any impact on affected resources.

6.3.7 Human Health Impacts

According to Skull Valley Band and Tooele County officials, there are no other known private or public actions under consideration in Skull Valley. Therefore, there is no potential for cumulative effects on worker or public health, beyond what has been described for the proposed action in Section 6.1.7. These impacts have been determined to be small.

Cumulative effects on members of the public due to the presence of radioactive materials in Skull Valley include the effects of the proposed PFSF, in addition to effects that result from other known sources of radiation and pollution in the region. There are no foreseeable projects that would add substantially to the radiation environment in Skull Valley.

The nearest resident is about 3.2 km (2 miles) distant from the proposed PFSF and could receive a maximum annual dose of 0.000356 mSv (0.0356 mrem). This is about 0.01 percent of the radiation dose due to natural background radiation in the United States (see Table 3.18). Such small radiation doses can be received just by traveling from sea level to a few hundred feet of elevation, by moving to a different part of the United States, or by choosing one building material over another (such as stone vs. wood) (NCRP 1987b). In other words, a dose of 0.000356 mSv/yr (0.0356 mrem/yr) is well below the variability associated with the natural radiation environment in which humans live.

The cumulative risk to the population of Salt Lake County from radiation exposure to the proposed SNF shipments, when added to the exposure from other shipments of radioactive material, can be determined as follows. As reported in Section 5.7.2.8, the risk of latent cancer fatalities for SNF shipments through Salt Lake County (along the route from Green River, Utah; i.e., the route with the highest LCF risk) to the proposed PFSF would be no greater than 0.00031 per year. The Envirocare Facility west of Skull Valley accepts low-level radioactive wastes for disposal. Some of this radioactive material may pass through Salt Lake County, contributing to radiation exposures and cancer risks to county residents. In addition, some radioactive materials may pass through Utah on the way to disposal at DOE’s Nevada Test Site or elsewhere. The NRC staff has adopted health risk estimates from a recent EIS (NRC 1996; NUREG-1437, Addendum 1) as a bounding estimate of the other sources of radiation exposure that may contribute to cumulative health impacts. Addendum 1 reports a combined cancer risk estimate of 13 LCFs resulting from over 350,000 radioactive waste shipments through Clark County, Nevada, over a 40-year period (that is, about 0.33 LCF/yr). As explained in

Addendum 1, the number of shipments is substantially overestimated for Clark County and would be an extreme overestimate for Salt Lake County. However, if one adds the Addendum 1 estimate of 0.33 LCF/yr to the LCF reported in Section 5.7.2.8 (i.e., 0.00031 per year), the resulting cumulative risk would be 0.33031 LCF/year. This number represents less than one additional latent cancer fatality among the exposed population (which, according to national statistics, already experiences about 2,224 cancer deaths for every 10,000 population). Consequently, the NRC staff concludes that the cumulative health effects of SNF and other radioactive waste transport on the population of Utah is small.

6.3.8 Other Impacts

Noise. Noise does not add linearly; rather, cumulative effects would be dominated by the loudest audible source. Noise impacts during construction and operation of the proposed PFSF and new rail line have already been evaluated in the earlier discussion of impacts in Sections 4.8 and 5.8. Moderate temporary impacts would result from the substantial increase in road traffic along Skull Valley Road, particularly during the first phase of construction. Other noise impacts are likely to be small.

Scenic qualities. Construction and operation of the proposed PFSF at Site A combined with construction and operation of the rail line and siding would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. The staff concludes that the combined visual impact would be moderate because the visual presence of the proposed facilities would alter noticeably the scenic qualities of Skull Valley as viewed from recreational areas, residential areas, Skull Valley Road, and Interstate 80 (see Section 6.1.8.2).

In addition to this alternative, other past, present and reasonably foreseeable actions have and will continue to affect scenic quality in Skull Valley. Other past and present actions include residential, commercial, and ranch development in and around the Reservation, construction and use of Skull Valley Road and the power distribution line along the road, construction and use of Interstate 80, and construction and operation of other industrial facilities (such as the MAGCorp plant near Rowley, Utah) that are visible from Interstate 80.

The NRC staff estimates the magnitude of existing visual impacts from these past and present actions to be moderate because they have altered noticeably the scenic qualities of Skull Valley and the surrounding area. The staff is not aware of any other future actions that would contribute to cumulative impacts to visual resources.

Together, the impacts of the proposed action and the impacts of these other past and present actions would continue to change the scenic quality of Skull Valley from an undeveloped rural area into an area with residential, commercial, transportation, and industrial developments. The staff concludes that these changes would represent a moderate cumulative impact because they would combine to alter noticeably the scenic qualities of Skull Valley and the surrounding area.

Recreation. There are no known or planned activities in Skull Valley that could produce adverse impacts to recreational resources and opportunities near the proposed PFSF site. The BLM is currently reviewing lands it administers near the Cedar Mountains WSA for wilderness characteristics (see Section 3.8.3); and it is unknown if these additional lands with wilderness characteristics would be incorporated into the WSA. Any future determination on the inclusion of those areas to the Cedar Mountains WSA would likely have beneficial impacts to non-motorized recreation. If BLM does expand

the Cedar Mountains WSA to include these properties, the cumulative effect would likely improve, rather than impair, non-motorized recreational opportunities on the west side of Skull Valley, but could produce a negative impact for motorized recreation.

6.3.9 Environmental Justice

A potential consideration under environmental justice is the possibility that, while the environmental impact of a facility is not large, the impact on a minority or low-income community is disproportionately adverse because the group: (1) is being currently affected by other facilities or environmental problems that leave them disproportionately vulnerable to adverse environmental effects of the facility in question; (2) has been disproportionately affected by past projects or environmental practices, leaving them more vulnerable now; or (3) has language barriers, geographical immobility, or inherently poorer access to health care or other response mechanisms than the majority population, again leaving them more vulnerable to any environmental or socioeconomic impact. In this case, the expected radiological and non-radiological health impact from operation of proposed PFSF is small for the general public for either normal operations or credible accidents; thus, the enhanced vulnerability concern does not apply because very little risk is added by the proposed PFSF facility.

Physicians in Tooele are under contract to the Indian Health Service to provide first-tier medical services to the Skull Valley Band, but inquiries to the Indian Health Service produced no data on the Skull Valley Band. Inquiries by the NRC staff and PFS to the Utah Department of Health also did not produce any data that identified any specific health problems in the Skull Valley Band. It was not possible to identify any unusual incidences of diseases in Tooele County, the smallest area for which published health information is available. While the incidence of chronic diseases is slightly higher in Tooele County than in Utah as a whole, it is not clear that the difference is statistically significant, nor is the income and ethnicity of individuals with chronic diseases available. While sufficient data do not exist that show any unique health conditions among the Skull Valley Band, there is also no evidence that the proposed PFSF would compound any health problems of nearby residents or visitors in the Skull Valley vicinity.

Summary. Examination of the various environmental pathways by which low-income and minority populations could be disproportionately affected reveals no disproportionate high and adverse impacts from construction or normal operations. There are also no credible accident scenarios by which such impacts could take place. Thus, the cumulative effect of the proposed PFSF and other activities on environmental justice concerns through direct environmental pathways is small. When considering past, present, and foreseeable future actions, the impacts from the proposed PFSF would add little to the indirect impacts and cumulative impacts and are considered to be small.

6.4 Unavoidable Adverse Environmental Impacts

There are certain limited potentially unavoidable adverse impacts associated with the construction and operation of the proposed PFSF, as well as with the transportation of SNF. Such impacts are discussed in this section.

6.4.1 Geology, Minerals, and Soils

Unavoidable soil erosion from both wind and water will occur during construction activities. Dust control and stormwater control measures, as well as revegetation of disturbed areas, will minimize soil erosion. With these mitigations, the resulting levels of soil erosion by wind and water should be similar to the levels that currently exist in Skull Valley.

Disturbing the existing soil profile and using aggregate (e.g., crushed stone) in construction are unavoidable adverse impacts of the proposed action. However, only a very small amount of soil is permanently lost in project construction, and aggregate materials could be recovered after decommissioning. Economic mineral resources located beneath the proposed PFSF and the new rail line would be unavailable for exploitation during the life of the project. These impacts, however, would be small.

6.4.2 Water Resources

Unavoidable impacts to surface water may be related to increased stormwater runoff from the areas of the proposed PFSF due to the presence of impervious surfaces (i.e., buildings, asphalt, concrete). Such runoff would be controlled under general permits (see Sections 1.6.2.1 and 1.6.2.3). Also, the possible presence of motor oils and greases from construction or operations equipment could result in a degraded quality of this runoff compared to what exists now.

No unavoidable adverse impacts on groundwater are expected as a result of construction or operation of the proposed disposal facility, because of the relatively small quantities of water to be used from newly drilled on-site wells. Withdrawal of water from these new wells is not expected to impact other users of groundwater in Skull Valley.

6.4.3 Air Quality

Unavoidable impacts to air quality from construction of the proposed PFSF would be associated with earth-moving activities that create airborne dust. Through the use of adequate control measures, such as treating disturbed areas with water or chemical surfactants for dust suppression, the potential impacts to air quality due to suspended particulate matter would be minimized. The impact on regional air quality is expected to be small.

6.4.4 Ecological Resources

The project as proposed would require the commitment of 57 ha (140 acres) for the main facility and 63 ha (155 acres) for a new rail line for a total of about 120 ha (295 acres) for the life of the facility (i.e., up to 40 years). The loss of wildlife habitat in these areas would be unavoidable. In areas lost for the life of the project, the existing vegetation, with the exception of invasive annuals such as cheatgrass, would not be restored unless revegetation is undertaken as part of non-radiological decommissioning and closure of the PFSF as required by the lease. Plant species composition and diversity would be altered because of this disruption of the natural vegetation and subsequent revegetation. Although the removal of habitat would be temporary, the natural diversity of plant species may not recover. If revegetation is to be part of non-radiological decommissioning and closure, a plan, similar to those described in Sections 4.4 and 5.4, would need to be developed consistent with the then-latest guidance.

Currently, this land is sparsely vegetated and supports low numbers of wildlife. Small amounts of animal habitat would be unavoidably lost in the disturbed areas during construction activities. It is likely that individual animals of less mobile species would be lost during construction.

Areas that are to be fenced, including the 40-ha (99-acre) restricted-access area, would be unavoidably lost for use by certain wildlife species such as mule deer and pronghorn antelope for as long as the fences are up. These impacts are expected to be small, especially considering the other available land areas in Skull Valley that are comparable to the potentially affected area.

6.4.5 Socioeconomic and Community Resources

Because of the size of the regional employment force and the relatively small number of workers to be employed on the proposed project, no adverse socioeconomic impacts are expected from the project. Likewise, there should be no adverse impacts to the local infrastructure, with the possible exception of traffic on Skull Valley Road. Increased traffic would accompany construction and operation of the proposed PFSF.

Construction and operation of the proposed PFSF should have no adverse impact on the use of off-site land near the site on the Reservation. However, construction of a new rail line from Skunk Ridge would impact the land use of the proposed right-of-way corridor, including grazing areas, until such time as the rail line were removed and the land revegetated.

6.4.6 Cultural Resources

Based on available data, construction and operation of the proposed PFSF on the Reservation would have no adverse impact on historic properties. In the unlikely event that buried cultural resource sites or artifacts are encountered during construction activities, the significance and potential for adverse impacts would be evaluated at that time.

Based on cultural resources field inventories (see Section 3.6) of all proposed project areas in Skull Valley, and subsequent *National Register* evaluations and agency consultations, the Cooperating Agencies have determined that activities associated with construction of the Skunk Ridge rail line would adversely affect parts of eight historic properties that have been evaluated as being eligible for inclusion on the *National Register* (see Section 5.6.1.1). These include historic properties 42TO709 (discussed in greater detail in the next paragraph), 42TO1409, 42TO1410, 42TO1411, 42TO1412, 42TO1413, 42TO1416, and 42TO1417, as identified in the cultural resources Class II (intensive field survey) studies (Birnie and Newsome 2000). Impacts to sections of these sites that lie within the rail right-of-way corridor will be mitigated prior to construction. During construction, temporary barricades will be constructed along the edge of the right-of-way at each historic property to prevent inadvertent loss of integrity to the portions of the properties being preserved outside the rail corridor, including the Hastings Cutoff.

The Hastings Cutoff Trail (42TO7909) would be directly affected because the trail transects the proposed rail corridor (see Figure 1.2). Thus, a short segment of the trail that currently retains a high degree of physical integrity would be destroyed. In addition to the impact to the physical integrity of the trail, the presence of the rail line itself would be an intrusion on the place and setting of the historic trail in an area that still evokes an impression of the original cultural landscape of this western migration route. Mitigation measures have been identified in the Memorandum of Agreement developed as part

of the consultation process under Section 106 of the NHPA (see Section 9.4.2) that would ameliorate these impacts.

6.4.7 Human Health Impacts

The impacts of radiation emitted from SNF casks during transport to or storage at the proposed PFSF cannot be avoided. However, the radiation doses that would occur as a result of the proposed action are well below NRC regulatory limits and represent a small fraction of the existing background levels of radiation, and the radiological health risk is considered to be small.

6.4.8 Other Impacts

6.4.8.1 Noise

Increased noise will accompany construction and operation of the proposed PFSF; however, the anticipated noise levels will not create adverse impacts. Increased traffic on Skull Valley Road due to workers at the facility, as well as noise from the train(s) moving SNF to the proposed PFSF from the new Skunk Ridge siding, would generate additional noise. The increased noise would be audible to residents along Skull Valley Road.

6.4.8.2 Scenic Qualities

Because the proposed PFSF differs from the rural and undeveloped nature of the surrounding landscape, visual impacts to the scenic qualities of Skull Valley would be unavoidable during construction and operation. After the SNF has been removed to a permanent repository, the impacts to the scenic qualities of Skull Valley could be eliminated by removing all facilities and recontouring the landscape to its original condition.

6.4.8.3 Recreation

There should be no unavoidable adverse impacts to recreation associated with the construction and operation of the proposed project at the proposed site. Construction and operation of the proposed rail line from Skunk Ridge to the proposed site may have some limited adverse impacts to certain recreational values found on the BLM-administered land (e.g., solitude and some OHV activities) but would not adversely affect others (e.g., camping and bird watching). In addition, although the proposed rail line right-of-way does not cross any of the land parcels recently reinventoried for wilderness characteristics, construction and operation of the proposed rail line could change recreational opportunities on adjacent and nearby public lands.

6.4.9 Environmental Justice

The principal unavoidable impact could come through the loss of any species and habitat that may be of subsistence or cultural importance to Native Americans. Depending on what species are affected, this could be of some significance to some of the more traditional Skull Valley Band members. However, the species and habitat found on the site and in the rail corridor have not been identified as unique; therefore, the impact would be small.

6.5 Relationship Between Short-Term Uses of the Environment and Long-Term Productivity

Short-term uses of the environment for the proposed project include (1) using a portion of the Reservation for the interim storage of SNF, (2) using a portion of the land in Skull Valley for a new rail line, and (3) obtaining railbed ballast and construction aggregate from local quarries. These short-term uses of the environment would provide an option for SNF storage to help ensure the continued operation of existing U.S. nuclear power plants.

The proposed action would produce favorable short-term effects on the local economy, including that of the Skull Valley Band. Under the proposed action, economic productivity of the land on the Reservation would be enhanced far above its current use and economic value.

The land in Skull Valley that would be occupied by the proposed project is presently undeveloped rangeland. A limited amount of grazing currently occurs on this land, and the land to be used by the proposed PFSF and the new rail line does not have any other current agricultural or productive uses. The use of this rangeland for the proposed project would reduce the amount of such land available in Skull Valley, but the reduction would not be a significant amount. The proposed project would replace this rangeland with an industrial development which has its own infrastructure in the form of a new rail line. The addition of such infrastructure to Skull Valley would increase the productivity and usefulness of the land far above its current use for limited cattle grazing and could potentially increase the opportunities for further economic development for the Skull Valley Band and/or other unused portions of Skull Valley.

The proposed PFSF is an interim facility and would not be a permanent addition to Skull Valley. Before termination of the lease and NRC license, the PFSF would be decommissioned, and the property could be reused for other purposes. Likewise, the new rail line could either be removed or reused for other purposes. Therefore, there would be no long-term commitment of the proposed project areas in Skull Valley, and there would be no impairment to the long-term productivity of these areas.

Any increases in noise, road traffic, water use, suspended particulates, and radiation doses associated with construction, operation, and closure of the proposed PFSF would cease upon termination of the license for the facility.

6.6 Irreversible and Irretrievable Commitment of Resources

The land upon which the proposed PFSF, the new access road, and the new rail line (or new ITF) would be constructed would be lost to other uses until completion of decommissioning of the facility and the license is terminated. The commitment of lands involves the loss of plant and animal resources, as well as habitats that currently exist, or that could exist, on those lands. In addition, certain wildlife species may not be able to use areas to be fenced as part of the project.

Approximately 94 ha (232 acres) of vegetation and wildlife habitat on the Reservation would be cleared for the life of the proposed project. An additional amount of land [up to 63 ha (155 acres) more] could be cleared of vegetation for the life of the project to accommodate a new rail siding and new rail transportation corridor from Skunk Ridge to the proposed site of the facility. The affected

areas could be revegetated and returned to current use by wildlife after the license for the facility is terminated.

Construction and operation activities would consume materials that may not be recyclable or recoverable. The portion of excavated soil used to create soil cement would be irretrievably lost. Construction, operation, and closure of the site would require a commitment of human and financial resources. Commitments of machinery, vehicles, and fossil fuels would also be required during the project; however, none of the aforementioned resources are in short supply in the vicinity of the proposed project.

Water would be consumed for dust suppression during construction and during the on-site manufacture of the concrete storage pads and casks. Water used during the project (except for water chemically bound in the manufacture of concrete) would eventually recycle to the atmosphere for distribution elsewhere. Water obtained from aquifers would eventually be replaced by natural recharge processes.

No known commercially valuable mineral resources are expected to be affected by the project, although access to any such resources that may exist beneath the site of the proposed PFSF and the proposed Skunk Ridge transportation corridor would be precluded until the facility is decommissioned before the license is terminated.

6.7 Potential Impacts of the No-Action Alternative

According to PFS's ER (PFS/ER 2001), not building the proposed PFSF could have the following consequences:

- increased probability of shutdown of operating reactors before operating license expiration due to the lack of adequate SNF storage capacity, with the attendant loss of electrical power generation for that area or region,
- delays in reactor decommissioning activities due to the inability to remove SNF from sites in a timely manner, resulting in continued expenditures associated with SNF storage at permanently shutdown reactors,
- the need to construct additional at-reactor ISFSIs to handle the anticipated need for SNF storage.

The no-action alternative is included in this FEIS to provide a baseline for comparison with the proposed action. Under the no-action alternative, no PFSF and no transportation facilities would be constructed in Skull Valley. The impacts described in Chapters 4 and 5 of this FEIS would not occur, and Skull Valley would remain as it is today (see Chapter 3). No lease payments would accrue to the Skull Valley Band, and the Band's economic situation would likewise continue as it is today. In addition, the economic benefits to the state of Utah and Tooele County under Alternatives 1-4 would not occur under the No-Action Alternative.

While the no-action alternative would avoid any impacts on Skull Valley due to the construction and operation of the PFSF and related transportation facilities, it could lead to impacts at other locations. If the proposed PFSF is not built in Skull Valley, SNF would continue to accumulate at nuclear power plants. Based on current DOE plans, removal of SNF from nuclear power plant sites would not begin until 2010 at the earliest, when DOE anticipates that a permanent geological repository will be ready to begin receiving SNF. Most SNF is currently being stored in SNF pools that were built along with the

reactor systems. Some power reactor licensees have expanded their pool storage capacity to accommodate the accumulated SNF. A few have built at-reactor ISFSIs to store their SNF in dry casks using a technology similar to what is proposed for Skull Valley (see Figure 1.5). Licensees that cannot expand their SNF storage capacity at their sites may have to terminate operations when their available SNF storage capacity is filled.

As described in Section 2.2.5, the no-action alternative would allow for only two options in regard to the continued storage of SNF: (1) either the capacity of at-reactor SNF storage facilities would have to be expanded or new at-reactor SNF storage facilities would have to be constructed or (2) the operating reactors would have to shut down when their existing storage capacity is reached. The potential environmental impacts of the first of these two options are examined in this section. While the Cooperating Agencies recognize that many environmental impacts could result from shutting down nuclear power reactors, a full evaluation of these potential environmental impacts (such as reduced power availability or the generation of additional air pollution from replacement sources of electricity) is beyond the scope of this FEIS. The local and regional impacts resulting from the loss of electric generating capacity for shutdown reactors, including the potential for increased electricity prices, are speculative and are not addressed in detail in this FEIS.

The NRC has examined, in support of other agency actions, the environmental impacts of at-reactor ISFSIs. In support of its Waste Confidence Decision, NRC examined the environmental impacts of the operation of ISFSIs built at operating nuclear power plant sites. The Commission has made a general determination that, if necessary, spent fuel generated in any reactor can be stored without significant environmental impacts for at least 30 years beyond the licensed life for operation of that reactor at on-site or off-site ISFSIs (see 10 CFR 51.23; and 49 Fed. Reg. 34688, Aug. 31, 1984). The NRC has reviewed the Waste Confidence Decision twice [i.e., in 1990 (55 Fed. Reg. 38474, Sept. 18, 1990) and in 1999 (64 Fed. Reg. 68005, Dec. 6, 1999)] since it was first issued, and in both cases, the Commission basically reaffirmed the findings of the original decision.

On July 18, 1990, the NRC published a final rule on “Storage of Spent Nuclear Fuel in NRC-Approved Storage Casks at Nuclear Power Reactor Sites” (55 Fed. Reg. 29190, July 18, 1990), and issued a general license for storage of SNF at reactor sites (10 CFR 72.210). The environmental impacts of SNF storage at reactor sites were also addressed in an environmental assessment which tiered from the “Final Generic Environmental Impact Statement on the Handling and Storage of Spent Light Water Reactor Fuel,” NUREG-0575, August 1979, and the “Environmental Assessment for 10 CFR Part 72 ‘Requirements for the Independent Storage of Spent Fuel and High-Level Radioactive Waste,’” NUREG-1092, August 1984. The accompanying finding of no significant impact states that:

[T]he Commission concludes that this proposed rulemaking, entitled “Storage of Spent Nuclear Fuel in NRC-Approved Storage Casks at Nuclear Power Reactor Sites” will not have a significant incremental effect on the quality of the human environment.

Eleven existing at-reactor ISFSIs with specific licenses issued by NRC were previously identified in Chapter 1 (see Figure 1.5). For each of the eleven ISFSIs, an environmental assessment was completed and a finding of no significant impact was reached. For the no-action alternative with respect to the proposed PFSF, the NRC staff assumes that at-reactor ISFSIs would be constructed at reactor sites where additional storage capacity is needed and where physical constraints, such as available land at the reactor site, do not preclude the construction or operation of an ISFSI. The staff also assumes that the design, construction, and operation of future ISFSIs would be similar to that of existing ISFSIs. While a detailed examination of each reactor site where an at-reactor ISFSI could be

built has not been completed, the staff does not expect, as a general matter, based on the previous NRC studies discussed above, that the construction and operation of future at-reactor ISFSIs would result in significant environmental impacts. No further site-specific studies or evaluations have been undertaken in this FEIS in regard to the provision of additional at-reactor storage.

The following discussion includes impact assessments for future at-reactor ISFSIs prepared by the NRC staff as part of the current environmental review. Because of the large number of operating reactor sites, as well as their individual site characteristics, the discussion below is limited to broad observations about the nuclear power industry.

6.7.1 Geology, Minerals, and Soils

Because activities associated with the no-action alternative would occur at existing nuclear power reactor sites, there should be no significant impacts to geology, soils, or on-site minerals beyond the impacts already discussed in existing NEPA documentation for those sites.

The construction or expansion of at-reactor storage facilities would involve the use of construction materials, such as sand, aggregate, and gravel. These resources are generally not in short supply in the United States, and any impacts from their use is expected to be small.

6.7.2 Water Resources

Potential impacts to surface water and groundwater from the no-action alternative could arise from the increased use of these resources during construction and operation of new or expanded at-reactor storage facilities. These impacts are expected to be small based on the previous and current use of such resources for power reactor operations (i.e., considering existing reactor cooling and wet pool storage requirements) and existing on-site storage activities.

6.7.3 Air Quality

For construction activities related to the expansion or construction of new SNF storage at existing reactor sites, there could be air quality impacts associated with site preparation and earth-moving activities. These impacts at an individual reactor site would likely be less than the impacts for the proposed project in Skull Valley because the amount of at-reactor land to be disturbed should be smaller than the 40 ha (99 acres) proposed for the PFSF or the additional land required for the transportation facilities related to the PFSF; and, consequently, less suspended dust would be generated. However, if the distance to the nearest downwind site boundary and/or to the nearest resident for the new at-reactor storage facilities were less than the distances for the proposed site in Skull Valley, then any reduction in impacts as a result of generating a smaller amount of fugitive dust emissions could potentially be offset by higher airborne concentrations that would be associated with the shorter distances.

6.7.4 Ecological Resources

Potential impacts on ecological resources from the expansion or creation of at-reactor SNF storage facilities could arise from activities associated with disturbance of existing plant and animal habitats. Where storage would be expanded only within the owner-controlled area of existing reactor sites, impacts would most likely be small because of the existing industrial characteristics of these areas. If

new SNF storage facilities were developed in the vicinity of existing storage structures and minimal surface clearing were required, impacts to native vegetation, wildlife, wetlands, or species of special concern would be expected to be small.

6.7.5 Socioeconomic and Community Resources

For expansion or construction of new SNF storage facilities at existing reactors, there could be some socioeconomic impacts associated with the size of the workforce, land-use, and local traffic near existing nuclear plants. The potential effects would depend on the site and the type of expansion. Because the amount of additional SNF storage needed at any one reactor would be far less than the 40,000 MTU proposed for Skull Valley, the potential reactor-specific impacts should be smaller than those identified for Skull Valley.

Land use impacts could arise at those existing reactor sites where grazing, recreational activities, and other public access activities occur within the boundaries of the owner-controlled area. Where such activities occur, and where these same areas might be used for the expanded or newly constructed storage facilities, some adverse impacts could occur, but are not expected to be significant.

6.7.6 Cultural Resources

Expansion of SNF storage capacity at existing nuclear reactor sites could have some potential for impacts to cultural resources, if construction activities occur on previously undisturbed acreage at those facilities, but are not expected to be significant.

6.7.7 Human Health Impacts

Both public and occupational doses are associated with routine operations (including SNF storage) at a typical operating nuclear facility. Additional on-site storage of SNF would add a small incremental amount to the existing doses. Incremental increases in doses to workers would be monitored and would be administratively controlled so as not to exceed regulatory limits. Because the combined doses would still comply with NRC regulatory limits, there would be no significant impact to workers or members of the public from the storage of additional fuel.

6.7.8 Other Impacts

6.7.8.1 Noise

Noise would accompany any expansion or new construction of at-reactor SNF storage facilities. The magnitude and extent of noise impacts would be highly site-specific. In general, construction and operation of an at-reactor ISFSI would have noise impacts similar to those from the operational activities at the reactor itself, although they would be limited at any particular reactor site in comparison to the noise associated with PFSF construction and operation. Hence, any incremental noise impacts would be expected to be small.

6.7.8.2 Scenic Qualities

Creation or expansion of at-reactor SNF storage facilities could cause changes in the visual features of the reactor site. If the new storage facilities were built adjacent to the much larger nuclear reactor

facilities, the visual effects would be insignificant because they would not be readily apparent or distinguishable to viewers of the reactor site.

6.7.8.3 Recreation

As discussed in Section 4.2.5, there may be reactor sites where recreational activities occur within the OCA. Where such activities occur, and where these same areas might be used for the expanded or newly constructed storage facilities, some adverse impacts to recreation could occur, but are not expected to be significant.

6.7.9 Environmental Justice

The potential impacts under the no-action alternative would result from the options of expanding SNF storage capability at existing nuclear reactor sites. In the event that new on-site storage facilities are constructed, such construction and operations would occur within the boundaries of the existing power plants. Because these construction activities are expected generally to result in small impacts to the environment, as set forth above, there should be no disproportionately high and adverse impacts to minority and low-income populations and therefore no environmental justice concern. The additional, incremental radiation that would emanate into the environment from these new storage facilities would comply with NRC dose limits, so no significant offsite impacts and no environmental justice concerns would be expected from radiation.

6.7.10 Economic Costs of No Action

As a consequence of continued generation of SNF and the need to store SNF at reactor sites until a permanent repository can accept it, the no-action alternative would likely result in increased at-reactor SNF storage costs. These costs include capital costs for constructing at-reactor ISFSI's, operating costs for at-reactor ISFSI's, and costs for operating cooling pools which would need to be in service for longer time periods if no action was taken (i.e., maintaining the current spent fuel storage methods, if the proposed PFSF was not available). The increased costs would vary over time and by reactor site depending on site-specific factors including available space and cost. The following per unit costs (see Table 8.1) are considered typical of at-reactor storage for the no-action alternative:

- \$8,000,000—annual spent fuel storage pool operating cost
- \$600,000—annual cost to operate an at-reactor ISFSI at a site that also has a spent fuel storage pool
- \$9,184,000—upfront capital cost of an at-reactor ISFSI (if the reactor site does not already have an ISFSI)
- \$8,084,620—upfront capital costs if the reactor site requires a dry transfer system
- \$93,737 to \$152,596—range of incremental costs per metric ton for dual purpose canister systems required for at-reactor ISFSI SNF storage

The no-action alternative would not change at-reactor costs for sites that would not have utilized the PFSF. Chapter 8 provides a detailed account of how at-reactor costs would tend to vary between no-action and the proposed action.

7. EVALUATION OF AN ALTERNATIVE SITE IN WYOMING

Consistent with the requirements of NEPA, this FEIS compares the impacts of the proposed action to the impacts of alternatives. One alternative is locating the proposed PFSF some place other than the Reservation of the Skull Valley Band of Goshute Indians. As an independent regulatory agency, the NRC does not select sites or participate with an applicant in selecting proposed sites. The NRC does not have the authority to require an applicant to submit a totally different proposal, such as building on a different site. Rather, the NRC may make one of three determinations on an application for a proposed action, namely, the NRC may: (a) grant the application (i.e., authorize the proposed action), (b) grant the application subject to certain conditions, or (c) deny the application. However, because many environmental impacts can be avoided or significantly reduced through proper site selection, the NRC examines the applicant's site selection process to ensure that adequate consideration is given to alternative sites. NRC guidance for environmental reviews for power reactors does not apply to the review of an ISFSI. For evaluating alternative sites, that guidance specifies that the applicant submit a slate of alternatives, and the NRC compares the proposed site to the alternatives to determine if an obviously superior alternative site has been identified (see 49 Fed. Reg. 9352, 9354, March 12, 1984). While not directly applicable to the requested action, the guidance has informed the staff's review of alternatives to the site on the Reservation proposed for the PFSF. Accordingly, the NRC staff, as set forth below, has evaluated the proposed site to determine if an obviously superior site has been identified.

The proposed action under consideration in this FEIS (see Sections 1.2 and 1.5) applies to Site A at the Skull Valley location. As discussed in Section 2.2.3.1, PFS's site selection process identified a site in Fremont County, Wyoming, as a candidate site for the proposed PFSF. While the Wyoming site is not being actively considered by PFS for the siting of an SNF storage facility, it is nevertheless appropriate for use in this FEIS for comparison purposes. The Wyoming site was evaluated by the NRC staff to determine if it is obviously superior to the Skull Valley site selected by PFS (i.e., Site A). In this chapter, the potential environmental impacts of constructing and operating the proposed PFSF at the Wyoming site are compared to those of the Skull Valley site. While the level of information on the Wyoming site is less detailed than that for the Skull Valley site, it is sufficient to reasonably characterize how the impacts from the proposed PFSF would likely differ if it were sited in Wyoming instead of Skull Valley. The comparative analysis is also intended to assist in more accurately gauging the extent, magnitude or degree of any potential environmental impacts that may be associated with the Skull Valley location.

7.1 Site Selection Process

From April through June 1996, PFS began the process for selecting a site for an ISFSI. Initially, PFS began evaluating 38 separate potential sites (see Table 7.1). Twenty-six of these sites, including the Skull Valley site, were derived from the Nuclear Waste Negotiator's (NWN) list of sites identified by those jurisdictions that had expressed an interest in hosting a Federal monitored retrievable storage (MRS) facility. Some of the jurisdictions controlling these sites also expressed an interest in hosting the PFSF. The other 12 sites were identified from entities that contacted PFS and requested that each of those sites be considered as a possible site. The four phases of the process for evaluating the candidate sites are described in PFS's ER (see Chapter 8 in PFS/ER 2001) and are summarized below.

Table 7.1. Potential host sites considered for the proposed PFSF

No.	Potential host site	No.	Potential host site
01	Mescalero Reservation (Lower Three Rivers Site); New Mexico	20	Northern Arapaho; Wyoming
02	Mescalero Reservation (Ranch House Site); New Mexico	21	Ponca Tribe; Oklahoma
03	Goshute Tribe; Skull Valley, Utah	22	Prairie Island Sioux; Minnesota
04	Santee Sioux; Knox County, Nebraska	23	Sac & Fox Nation; Oklahoma
05	Absentee Shawnee; Oklahoma	24	San Juan County; Utah
06	Akhoik Kaguyak Tribe; Alaska	25	Tetlin Indian Reservation; Tetlin, Alaska
07	Alabama-Quassarte Tribe (Creek); Oklahoma	26	Tonkawa Tribe; Oklahoma
08	Apache County; Arizona	27	Ute Mountain Ute Tribe; Colorado
09	Apache Development Authority; Oklahoma	28	Yakama Indian Nation; Washington
10	NEW Corporation; Fremont County, Wyoming	29	City of Caliente & Lincoln County; Nevada
11	United Nuclear Corporation; New Mexico	30	U.S. Fuel and Security Service Group, Pacific Atoll (Palmyra Island); U.S. Protectorate
12	Caddo Tribe; Oklahoma	31	Barnwell; South Carolina
13	Chickasaw Nation; Oklahoma	32	Hanford; Richland, Washington
14	Eastern Shawnee; Oklahoma	33	Fort Wingate Army Depot; Gallup, New Mexico
15	Fifield Development Corp.; Fifield, Wisconsin	34	Atomic Energy of Canada Limited, Whiteshell Laboratories; Manitoba, Canada
16	Fort McDermitt Paiute Shoshone Tribe; Nevada	35	TGM, Inc.; White Sands, New Mexico
17	Grant County; North Dakota	36	Area 25, Nuclear Test Site; Nevada
18	Lower Brule Sioux; South Dakota	37	LADO Ranch; Texas
19	Miami Tribe; Oklahoma	38	Andrews County; Texas

Source: Table 8.1-1, PFS/ER 2001

During the first phase of PFS's site selection process, the PFS Board of Managers conducted an initial screening on all potential sites brought to their attention in order to eliminate candidate sites that were burdened by obvious disqualifying factors. These factors included:

- Willing host jurisdiction. The jurisdiction should be willing to host an ISFSI.
- Public acceptance. Local community attitudes should appear to be open to the siting of an ISFSI.
- Favorable proximity to transportation access. The proposed site should be within reasonable proximity of transportation infrastructure.
- No jurisdictional restrictions. The jurisdiction of the proposed site must have no statutes or other legal restrictions that would prohibit the siting on an ISFSI. This criterion was used as an exclusion factor.

Applying the Phase 1 criteria, PFS eliminated 20 of the 38 sites. Nine jurisdictions that originally participated in the MRS siting process had declined or did not pursue DOE's funding to continue with the MRS process so the sites under their control were eliminated from further consideration. Four other sites were also eliminated based on an unwilling jurisdiction. The controlling entity of two of these sites participated in the MRS process, but subsequent to their participation in the MRS process, indicated that they were not willing to host an SNF storage facility. The other two sites (i.e., under the control of the Mescalero Apache tribe) were eliminated from further consideration because of an unsuccessful attempt by PFS to reach agreements with the controlling entity about the siting of an ISFSI. Finally, seven sites were eliminated because DOE declined to fund further study and evaluation of them as potential MRS sites. As a result of DOE's denial of funding to these sites, PFS did not believe further evaluations of these sites were warranted.

The objective of the second phase of PFS's site-selection process was to identify sites for further in-depth study and analysis. To achieve this objective, PFS performed further screening of the potential sites in the second phase by using the following criteria:

- Site availability. The proposed site should have one or more areas of suitable size available for acquisition.
- Site development cost. The proposed site should have one or more areas that could be developed at a reasonable cost.
- Flood plains. The proposed site should have areas of suitable size located outside of flood plains [as defined in 10 CFR 72.122(b)(2)]. This criterion was used as an exclusion factor.
- Geology. The proposed site should have stable geological conditions [as defined in 10 CFR 72.102(e)]. This criterion was used as an exclusion factor.
- Seismology. The proposed site should not be within the range of strong near-field ground motion from historical earthquakes on large known capable faults [as defined in 10 CFR 72.102(e)]. This criterion was used as an exclusion factor.
- Demography. The proposed site should be in an area of low population density.
- Environmental consideration. The proposed site should have areas of suitable size that would not significantly impact threatened or endangered species, wetlands, historical or archaeological resources, or major recreational areas. This criterion was used as an exclusion factor.

As part of the second phase, the PFS Board of Managers held a meeting on May 22, 1996, to select the sites that would be recommended for the third phase of the site-selection process. At the meeting, the PFS Board members were provided with: (1) an information sheet for all 38 sites that tabulated responses to a series of questions that were based upon the Phase 1 and 2 screening criteria (see Appendix F) (information was provided for the twenty sites eliminated in Phase 1, although they were

not considered in detail at the meeting), and (2) written evaluations of the sites for which the most detailed information was available, which included background information and identified the advantages and disadvantages of each site.

Although 18 of the 38 sites remained after the Phase 1 screening process, the PFS Board of Managers focused the meeting on the eight sites that were furthest along by virtue of information provided by the potential hosts. The eight sites included: (1) Santee Sioux; Knox County, Nebraska, (2) City of Caliente and Lincoln County, Nevada, (3) Goshute Tribe; Skull Valley, Utah, (4) Barnwell, South Carolina, (5) Hanford; Richland, Washington, (6) NEW Corporation; Fremont County, Wyoming, (7) U.S. Fuel and Security Services Group; Pacific Atoll (Palmyra Island), U.S. protectorate, and (8) United Nuclear Corporation; New Mexico.

Other potential sites were also discussed, but were generally deemed not to provide any greater potential for a satisfactory site than those already discussed. Thus, ten of the remaining 18 sites were eliminated. The discussion covered background information, as well as the various advantages and disadvantages of each site. The PFS Board of Managers identified four of the eight remaining sites as warranting further detailed evaluation. The four sites were: (1) City of Caliente and Lincoln County, Nevada, (2) Goshute Tribe; Skull Valley, Utah, (3) NEW Corporation; Fremont County, Wyoming, and (4) United Nuclear Corporation; New Mexico. Subsequent to the identification of these four sites, the host jurisdiction for the City of Caliente and Lincoln County, Nevada, decided not to participate in the additional studies. Thus, only three sites were left for further consideration.

The purpose of the third phase of the PFS site-selection process was to identify at least two candidate siting areas that would likely meet NRC's licensing regulations and not be unreasonably expensive to develop. The evaluation process used in this phase involved two steps. First, a "Site Selection Questionnaire," containing a list of detailed questions intended to determine the suitability of the site, was sent to the owners or promoters of the remaining three candidate sites. Second, a major engineering firm familiar with nuclear construction was engaged to conduct a field evaluation for each of the remaining three candidate sites. A set of judgment criteria (i.e., requirements, exclusion factors, avoidance factors, and preference factors) pegged to the detailed questionnaire was developed for the subsequent evaluation and selection of a final candidate site.

Responses to the site selection questionnaire were received from the controlling entity of each site by mid-June 1996 (see Appendix F). The engineering firm prepared an evaluation matrix for the three sites using the responses to the questionnaire and the field investigations. This evaluation concluded that the United Nuclear Corporation, New Mexico, site did not appear to offer sufficient contiguous land areas suitable for siting an ISFSI of the size anticipated for this project. This site was therefore eliminated from further consideration. The two remaining sites were the Skull Valley site and the New Corporation site in Fremont County, Wyoming.

In Phase 4, the remaining two sites were subjected to field investigations to further their technical and licensing viability. Three primary categories were used for the field investigations: environmental, technical, and permitting requirements. Environmental criteria included land use, demographics, cultural factors, ecological factors, hydrology, hazards, meteorological factors, visual impact, and auditory impact. Technical criteria included geologic factors, topography, drainage, siting, flexibility, cost, and accessibility. The final category included permits required for wetlands, dredge/fill operations, Endangered Species Act compliance, and building. The results of the field investigation were formally documented in a report to PFS in August 1996 (Stone & Webster 1996).

The field investigation concluded that the two remaining sites ranked very closely to each other on the overall technical evaluation criteria and that both sites were suitable for development of a SNF storage facility. The Wyoming site was found to rank slightly higher, based on the point system developed by the engineering firm. Based on the findings of the technical and environmental evaluations, the PFS Board of Managers authorized negotiations with the owners of both sites. As a result of this process, the Skull Valley site was ultimately chosen over the Wyoming site by PFS based upon (a) a more favorable lease or purchase arrangement with the land owners, (b) greater distance to population centers, (c) the promoter of the Wyoming site possessing only an option to purchase the site, (d) uncertainties associated with the required legislative approval for the Wyoming site, and (e) a favorable vote by the Skull Valley Band's tribal council to proceed with the project.

The PFS site-selection process has a rational, objective structure and appears reasonable. The approach of using the NWN sites, as well as others that expressed an interest in hosting the PFSF, as the set of sites considered also appears reasonable. Specific weighting and ranking factors were not developed by PFS Board of Managers, therefore, it is difficult to ascertain specifically how the PFS Board of Managers quantitatively evaluated and selected the four candidate sites. However, based on the information provided on these four sites, the Board of Managers did have objective information that would allow them to make a reasoned decision among the alternative sites. Once the candidate sites were selected, PFS performed site investigations and evaluated the sites using specific technical and environmental criteria. Weighting factors were used to rank the sites. The PFS site selection process, therefore, appears to be reasonable.

7.2 Characteristics of the Wyoming Site

The alternative site in Wyoming is located north of Shoshoni, Wyoming, about 39 km (24 miles) northeast of Riverton and about 16 km (10 miles) southeast of the Owl Creek Mountains (see Figures 7.1 and 7.2). It is also about 9 km (6 miles) east of the Wind River Indian Reservation. The siting area is located on privately-owned land that is currently used for the seasonal grazing of livestock. The siting area offers locations of sufficient size to support the minimum needs of the facility. A Burlington Northern Santa Fe Railway line runs adjacent to the site. The layout of the facility and its design would be similar to that described in Section 2.1.1.2 for the proposed PFSF in Skull Valley. One significant difference between the proposed site in Skull Valley and the alternative site in Wyoming is that the Wyoming site is located adjacent to an existing railroad and would require approximately 1.6 km (1 mile) of new rail construction for access.

Water well records obtained from the State of Wyoming in 1996 indicate the presence of domestic wells approximately 1,380 m (4,500 ft) southwest and 1,380 m (4,500 ft) northwest from the center of the Wyoming site. Residences exist at each of these well locations. Thus, the nearest resident(s) in Wyoming would be closer than in Skull Valley. Population characteristics in the vicinity of the Wyoming site differ from the Skull Valley site. Both the towns of Shoshoni and Bonneville are within 3.2 km (2 miles) of the Wyoming site. In 1990, the population of Shoshoni was 497. PFS estimates that the population of Bonneville is 60 (PFS/RAI2 1999).

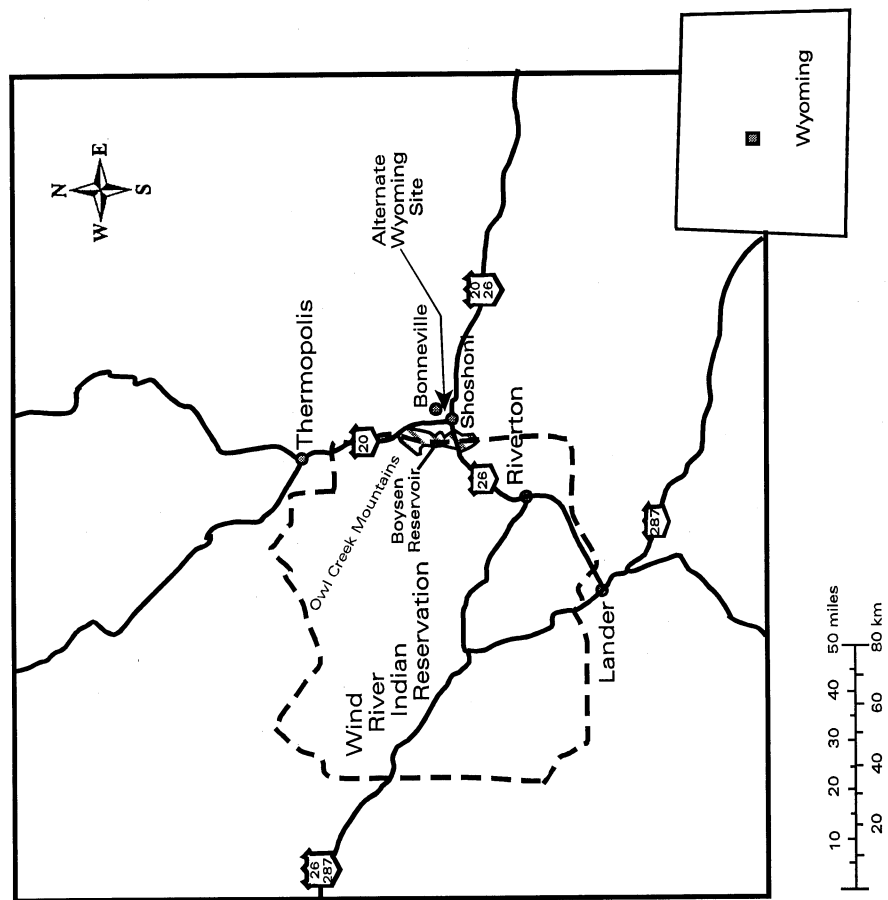


Figure 7.1. Possible location of an alternative spent fuel storage facility in Wyoming.

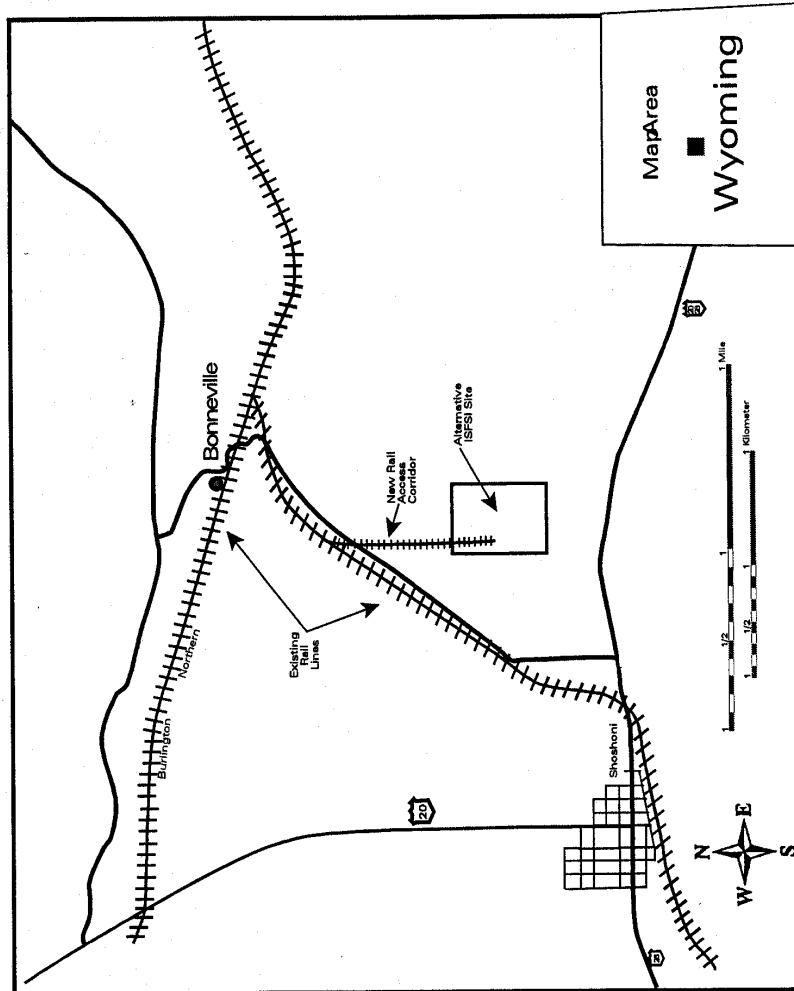


Figure 7.2. Possible site for a spent fuel storage facility near Shoshoni, Wyoming.

7.3 Impacts of Constructing and Operating an SNF Storage Facility at the Wyoming Site

As discussed in Section 2.2.3.1, PFS has identified an alternative site in Wyoming for its SNF storage facility. An evaluation of potential environmental impacts at this Wyoming location has been conducted for comparison to the impacts described in Chapter 4 for an SNF storage facility at Site A in Skull Valley, Utah. The discussions below present the relevant aspects and characteristics of the environmental setting in Wyoming in sufficient detail to provide an understanding of how construction and operation of the proposed PFSF might impact the Wyoming site as compared to its impacts at the Skull Valley site. Table 7.11, discussed further in Section 7.6, provides a resource by resource summary comparison of the impacts at the two sites.

It is not the intent of the following sections to definitively describe the magnitude, extent or degree of the potential impacts of construction and operation of an ISFSI in Wyoming. Instead, the characteristics of the Wyoming site are compared to those in Skull Valley to assist in evaluation of the impacts associated with the use of the Skull Valley site, and to reach a conclusion as to whether the Wyoming site is obviously superior to the Skull Valley site.

7.3.1 Geology, Minerals, and Soils

Like the preferred site, environmental impacts to soils at the Wyoming site include loss of the soils resource because of physical alterations to the existing soil profile. Similarly, impacts would occur to economic geologic resources (e.g., aggregate) from their use as construction materials and from possible access restrictions to minerals beneath the site. PFS has indicated that sufficient quantities of aggregate material would be available. The closest sources of aggregate would be approximately 42 to 45 km (26 to 28 miles) south of Riverton, Wyoming. Sand and gravel aggregate construction materials are readily available in Fremont County. Because mineral resources (coal) are widely available and more economically obtained elsewhere in the area, impacts from the unavailability of any coal beneath the site would be small.

USDA (1993) reports that soils at the Wyoming site are shallow [about 45 cm (18 inches)] and well drained. Hazards of water and wind erosion are severe and moderate, respectively. Use of the soils for roadfill, sand, or gravel construction materials is poor to improbable due to excess fines. Topsoil quality is poor due to the presence of small stones. The ability for water to move downward through the saturated soils is slow (0.2 to 0.6 inch/hr), and pH varies between 7.9 and 9.0. Shrink-swell potential is moderate (between 3 and 6 percent). These soil characteristics are similar to those at the preferred site in Skull Valley (see Section 3.1).

The seismic characteristics at the Wyoming site are also compared to those at the preferred site and are found to be similar. Earthquakes pose a geologic hazard at the Wyoming site as they do at the proposed Skull Valley site (see Section 3.1). Case (1999) describes the presence of the east-west trending Stagner Creek Fault system located north of the town of Shoshoni and about 13 km (8 miles) north of the Wyoming site. This fault is considered to be a capable fault as described in 10 CFR Part 100, Appendix A. The fault is considered to have the potential for causing a magnitude 6.75 earthquake, which is similar to the potential for the Stansbury Fault causing a magnitude 6.8 to 7.0 earthquake estimated for the proposed Skull Valley site (see Section 3.12). Because the earthquake magnitude for the fault system near the Wyoming site is similar to that for the faults near the Skull Valley site, the seismic characteristics of the Wyoming site are considered to be similar to the Skull

Valley site. This factor, moreover, can be addressed by appropriate facility design modifications to assure the safe construction and operation of the proposed facility.

The Wyoming site is located in the Wind River Coal Basin, which contains thin layers of sub-bituminous coal. PFS reports (PFS/RAI2 1999) that the basin is mined along its edges where the coal is at or near the ground surface, and the closest exposure of coal-bearing rocks is roughly 13 km (8 miles) north of the site. Coal may be present at some unknown depth beneath the Wyoming site, but mining of that resource is unlikely due to more economically available coal located near the surface at other locations in the region.

Oil and gas reserves are also present in the Wind River Basin. A small abandoned gas field is located about 8 km (5 miles) east of the Wyoming site, and two exploratory wildcat wells are located about 1.2 km (0.75 mile) northwest of the site. The site area is included within the productive limit of the Fort Union Formation gas play, and the potential for exploration in the future is unknown. Mineral production in the site area is limited to a small uranium prospect located about 4 km (2.5 miles) northwest of the Wyoming site and a feldspar processing plant located just north of the site, where trona is currently processed and shipped.

On balance, the Wyoming site is similar from a seismic perspective; any differences between the seismic environment in Skull Valley and the Wyoming site can be addressed in the facility's design. The potential loss of mineral resources during construction and operation of an ISFSI is greater than that at the Skull Valley site.

7.3.2 Water Resources

Surface water. The Wyoming site is in the central part of the State where annual precipitation is approximately 25 cm (10 inches). The site lies on upland terrain between two ephemeral stream valleys. No perennial surface water features exist on site, and area drainage is to the ephemeral streams that ultimately feed into Boysen Reservoir. Although detailed analyses of site flooding potential have not been performed, flooding does not appear to be a concern at the Wyoming site because the site lies in an upland area.

Groundwater. The Wyoming site lies in the Wind River Basin in Central Wyoming. Groundwater occurs in coarse sand beds in the Wind River Formation, and most local wells are drilled to depths of 90 to 120 m (300 to 400 ft) to ensure adequate year-round water supply. Water quality is good at the depths of typical wells. The closest well to the site is located approximately 1,370 m (4,500 ft) from the site. Water quality and availability appear to be adequate to meet the ISFSI site construction and operational needs.

7.3.3 Air Quality

The area within 100 km (62 miles) of the alternative site in Wyoming is in attainment of all NAAQS. There is no *a priori* reason to believe that effects on air quality from construction and operation of an ISFSI at the Wyoming site would be appreciably different than at the proposed Skull Valley location. The most important factor in a more precise determination of the potential air quality impacts would be the location of the site with respect to its proximity to residences or other places likely to be frequented by members of the general public. Available information suggests that the nearest residences to the Wyoming site are about 1,400 m (4,500 ft) away. At that distance, impacts of construction activities

would be expected to be appreciably greater than the impacts to the nearest residence at the proposed site in Skull Valley, who are 3.2 km (2 miles) away from the preferred Site A in Skull Valley.

7.3.4 Ecological Resources

Impacts to ecological resources for the alternative site in Wyoming would be similar to those for the proposed PFSF site in Skull Valley and are expected to be small.

Vegetation. The potential impacts on vegetation for an ISFSI located near Shoshoni, Wyoming, would be very similar to those associated with a facility located in Skull Valley, Utah. The Wyoming site is located in the desert and basin vegetation zone of Wyoming which has an elevational range of about 1,200 to 1,800 m (4,000 to 6,000 ft) and a xerophytic flora (i.e., vegetation adapted to dry and arid environments) (Porter 1962). This intermountain basin area of Wyoming contains a mosaic of shrublands including desert shrublands (Knight 1994). The specific ecoregion in which the site is located is variously identified as the Sagebrush-Wheatgrass section of the Wyoming Basin Province [covering an area of approximately 75,600 km² (29,200 miles²)] (Bailey 1980) or as the boundary of the sagebrush steppe and wheatgrass-needlegrass shrub steppe (Küchler 1964). These ecoregions consist of open to dense grasslands that include widely dispersed to somewhat dense scatterings of shrubs. The primary vegetation within these regions is sagebrush or shadscale with a mixture of short grasses. Moist alkaline flats in this region support greasewood which is alkali-tolerant.

The useable area of the Wyoming site is mainly flat to gently sloping and is largely rangeland that is too arid to graze livestock economically (Gillespie et al. 1996; Stuart and Anderson 1998). On the site itself, the dominant vegetation in July was observed as short grasses with some shrubs, cacti, yucca, and vetches (Gillespie et al. 1996). No unique habitats are found in the vicinity (Stone & Webster 1996a). The Wyoming site could encompass about 1,093 ha (2,700 acres) (Stuart and Anderson 1998). The expected land area needed for storage area in Wyoming is assumed to be the same as in Skull Valley [i.e., 40 ha (99 acres)]. This area is less than 4 percent of the area available at the Wyoming site.

Wildlife. The only specific sources of information provided concerning the wildlife at the Wyoming site is a Field Investigation Evaluation Report from 1996 (Stone & Webster 1996a) and a letter from the Wyoming Natural Diversity Database (Smith 1999). Information from older projects in the general area in which the site is located (e.g., NRC 1980a, 1980b; DOE 1985) indicates that the fauna are generally typical of desert scrub grassland communities of the intermountain region. The most common predators in the area are the coyote (*Canis latrans*) and badger (*Taxidea taxus*), which feed heavily on rodents and ground squirrels. Coyotes are also important predators of desert cottontails (*Sylvilagus audubonii*) and white-tailed jackrabbits (*Lepus townsendi*). Rodents are the most abundant small mammals in the area, and include such species as deer mice (*Peromyscus maniculatus*), northern grasshopper mice (*Onychomys leucogaster*), least chipmunk (*Butamias minimus*), and Richardson's ground squirrel (*Spermophilus richardsoni*). Large mammals that are likely to be present include mule deer, pronghorn antelope, and feral horses. Birds representative of sagebrush-grasslands and foothill scrub communities include such nesting passerine species as the horned lark (*Eremophila alpestris*), Brewer's sparrow (*Spizella brewerii*), sage thrasher (*Oreoscoptes montanus*), and the mountain bluebird (*Sialia currocoides*). Game birds such as sage grouse and mourning dove (*Zenaidura macroura*) are also likely to be present, as would raptor species such as kestrels, red-tailed hawks, ferruginous hawks, and burrowing owl.

Based on the available information, it appears that wildlife species composition at the Wyoming site is generally similar to that at the Skull Valley site. Thus, the impacts to wildlife at the two sites are expected to be similar and would be small.

Perennial and ephemeral streams. Impacts on streams would be small. Two ephemeral streams are located near the Wyoming site: Badwater Creek and Poison Creek. Drainage at the site is mainly subsurface except during infrequent local rain storms (Stone & Webster 1996a). Two or three dry washes occur within 1.6 km (1 mile) of the site. There is no aquatic habitat on or near the proposed Wyoming site; thus, there would be no impact to aquatic biota or perennial streams, as is also the case in Skull Valley.

Wetlands. Impacts on wetlands would be small. One area in the northern part of the site is classified as a wetland and would be avoided during construction (Stuart and Anderson 1998). Assuming that PFS would use BMPs similar to those proposed for Skull Valley, during construction, erosion would be effectively controlled in that area. Only if groundwater that is necessary to support this wetland were withdrawn for use by the project, would there be potential negative impacts. This is not likely since the groundwater that would be used for the project (see Section 7.3.2) would probably be drawn from a much greater depth than the groundwater that supports this wetland.

Threatened, endangered, and other species of special concern. The Field Investigation Evaluation Report documents that no surveys for rare or endangered species have been conducted on the site. According to the State of Wyoming, no endangered or threatened species use the Wyoming site. Table 7.2 lists species of special concern identified within the township under consideration for the Wyoming alternative site or within a one-township buffer zone around that site (i.e., a total of nine townships) (Smith 1999).

Two plant species are identified in Table 7.2 as species of special concern. Neither of the two plant species in that table is State or Federally listed. Both species were candidates for Federal listing in the past, but not enough information was available to determine if listing was appropriate. As of 1993, Owl Creek miner's candle (*Cryptantha subcapitata*) was considered to be declining, while the trend for persistent sepal yellowcress (*Rorippa calycina*) was unknown (58 Fed. Reg. 51143, Sept. 30, 1993).

Owl Creek miner's candle is a mat-forming perennial herb with white flowers that grows 5 to 15 cm (2 to 6 inches) high (Fertig 1994). The habitat for this species consists of sandy-gravelly slopes and desert ridges in sparsely vegetated cushion plant communities. The plants are potentially threatened by surface-disturbing activities. The entire distribution of this species is in the Owl Creek Mountains around Boysen Reservoir (Smith 1999), which is about 8 km (5 miles) from this alternative site. Two of the known four occurrences are located in the nine-township area around the alternative site.

Persistent sepal yellowcress, a member of the mustard family, is a rhizomatous, perennial herb with small yellow flowers (Fertig 1994). It is a regional endemic found along mudflats around reservoirs (Smith 1999) and, is therefore, unlikely to be present on this alternative site.

Whether either of these plant species occurs within the area that would be disturbed for a facility located at this site is unknown. Before this site would be used, surveys of potential habitat for these species would be necessary, and appropriate actions to mitigate effects on these species would have to be considered.

Table 7.2. Occurrences of species of concern in Fremont County, Wyoming, T38N R94W S23, and buffer zone^a

Scientific name	Common name	Federal status (animals) or management status (plants) ^a	Global rank/State rank ^b	Wyoming Game and Fish status (animals) ^c	Number of occurrences in area
Birds					
<i>Gavia immer</i>	Common loon	S-USFS R2 S-USFS R4	G5/S2B, SZN	WYGF-SSC1	1
<i>Buteo regalis</i>	Ferruginous hawk	N/A	N/A	SS	N/A
Plants					
<i>Cryptantha subcapitata</i>	Owl Creek miner's candle		G2/S2		2
<i>Rorippa calycina</i>	Persistent sepal yellowcress		G3/S2S3		5

^aS-USFS R2 = designated sensitive, U.S. Forest Service, Region 2; S-USFS R4 = designated sensitive, U.S. Forest Service, Region 4;

^b"G" Rank; G1 = Extremely rare, only 1 to 5 populations known throughout the world. May be critically imperiled; G2 = Very rare, between 6 and 20 known populations world-wide. May be imperiled; G3 = Rare, between 21 and 100 known populations worldwide; G4 = Apparently secure globally, over 100 populations, although it may be quite rare in portions of its range, especially on the periphery; G5 = Secure under present conditions; "S" Rank: State Ranks are preceded by an "S" and also range from 1 to 5, as above, with 1 being the rarest (only 1 to 5 populations within the State) and 5 being the most common (secure within the State); State Ranks have been augmented for migratory animals, primarily birds: A "B" following a State Rank will indicate the breeding status of the species within the State: Breeding Ranks range from 1 to 5, as above; "SZN" indicates species which are not of significant status when migrating through or wintering in Wyoming. Includes uncommon migrants of interest, as well as (1) rare species for which important habitats could be protected, but are difficult or impossible to define, and (2) abundant species wintering in or migrating through Wyoming.

^cWyoming Game and Fish Status—SSC1 = species with on-going significant habitat loss, populations greatly restricted or declining, and extirpation appears possible; SS = Wyoming state sensitive.

Source: Letter dated November 19, 1999, from Rebekah Smith, Wyoming Natural Diversity Database to Susan Davis, Stone and Webster.

Table 7.2 identifies two wildlife species in the vicinity of the Wyoming site as being of special concern. There is one record of the State-listed common loon (*Gavia immer*) on Boysen Reservoir, a few miles to the west of the site. Because no habitat exists on the proposed site for loons, no impacts to this species would be expected. There is also no record of any endangered or threatened species being present at the Wyoming site. The ferruginous hawk, a State-listed species in Wyoming, is reported to use the Wyoming site (Stone & Webster 1996a). This is in contrast to the Skull Valley site area, which may be used by the State-listed endangered peregrine falcon, the State-listed threatened ferruginous hawk, as well as a number of other species of concern as listed by the State of Utah and BLM.

7.3.5 Socioeconomic and Community Resources

The Wyoming site is located in a remote, sparsely populated area (see Table 7.3), and direct and indirect impacts to socioeconomic and community resources should be qualitatively and quantitatively similar to those at the remote, sparsely populated Skull Valley site. The only potentially significant difference in impacts to socioeconomic and community resources between the Wyoming site and the

proposed Skull Valley site would be a function of different construction and operating requirements associated with the local transportation option and the relatively larger population centers in the immediate vicinity of the Wyoming site. As noted in Section 7.2, the Burlington

Table 7.3. Population in Fremont County and incorporated areas

	1990	Estimated population				
		7/1/94	7/1/95	7/1/96	7/1/97	7/1/98
Wyoming	453,588	474,894	478,364	480,060	480,043	480,907
Fremont County	33,662	35,080	35,607	35,851	35,959	36,044
Dubois town	878	960	1,000	1,015	1,024	1,034
Hudson town	389	404	410	410	413	412
Lander city	7,023	7,178	7,283	7,340	7,360	7,378
Pavillion town	103	129	131	134	136	140
Riverton city	9,202	9,794	9,957	10,061	10,100	10,126
Shoshoni town	497	512	519	521	524	527
Balance of Fremont County	15,570	16,103	16,307	16,370	16,402	16,427

Sources: U.S. Bureau of the Census, 1990 and U.S. Bureau of the Census, 1999.

Northern Railroad rail line runs adjacent to the Wyoming site. This would obviate the need to construct a lengthy rail line connecting the main line with a SNF storage facility or over-the-road heavy-haul shipments of the SNF canisters. This would eliminate or substantially reduce the adverse traffic impacts, as well as the favorable economic impacts to the Skull Valley Band, associated with local transportation identified for the Skull Valley site (see Section 5.5).

Operational activities at the Wyoming site are assumed to be equivalent to those described for the proposed Skull Valley site. As is true for the Skull Valley site, there should be no significant impacts to socioeconomic and community resources.

Considering impacts to all socioeconomic and community resources (e.g., population, housing, education, and transportation), the Wyoming site is not significantly different from the Skull Valley site, with the exception of the favorable benefits to the Skull Valley Band. Some of those benefits (e.g., employment) would accrue to other persons in the vicinity of the Wyoming site, including Native Americans at the nearby Wind River Reservation.

7.3.6 Cultural Resources

Cultural resources studies equivalent to those performed for the Skull Valley site have not been completed for the Wyoming site, nor has consultation been initiated with the Wyoming SHPO or the Wind River Shoshone Tribe. Preliminary site file searches for the Wyoming site indicate no known

archaeological sites on the property. The closest NRHP property is the Castle Gardens Petroglyph Site, located near Moneta, some 32 km (20 miles) to the southeast.

The Wyoming site falls within the traditional homelands of the Wind River Shoshone Tribe (Shimkin 1947; Fox 1976). Today, the eastern boundary of the Wind River Indian Reservation is located about 5 km (3 miles) west of the Wyoming alternative site. Documentation of the presence or absence of traditional cultural locations on or near this site has not been completed, although no such cultural resource locations are known to exist at this time.

Based on available information, the Skull Valley and Wyoming sites are generally comparable, in that each is projected to have small potential for impacts to significant archaeological and historical resources, as well as traditional cultural properties important to regional Indian tribes. This preliminary assessment is based on the known cultural resource information for the Skull Valley site and the general ecological setting of the Wyoming site (e.g., absence of important natural resources for subsistence, landform relief, and permanent water sources). The lack of archaeological, historical, and Native American resource identification and evaluation studies at the Wyoming site do not permit the inclusion of specific mitigation measures; nevertheless, the general approaches listed in Section 4.6.5 for the identification and preservation or documentation of such resources would be applicable at the Wyoming site as well.

7.3.7 Human Health Impacts

Members of the general public and facility workers would be exposed to low levels of radiation during routine operation of an ISFSI in Wyoming. This would result in these individuals receiving a radiation dose. Because the design of an ISFSI in Wyoming is assumed to be identical to the proposed PFSF in Skull Valley, the dose to a hypothetical individual at the boundary of the facility in Wyoming would be the same as in Skull Valley (see Section 4.7.2). Similarly, doses to facility workers would be the same for the proposed PFSF.

Doses to the resident nearest the Wyoming site would be somewhat greater than for the nearest resident in Skull Valley, because the Wyoming resident is located at a closer distance [approximately 1 km (0.6 mile) as compared to approximately 3.2 km (2 miles) in Skull Valley]. Data for the variation of dose rate and distance, as presented in PFS's safety analysis report (PFS/SAR 2001), indicates that the annual dose to the resident nearest the Wyoming site would be approximately 0.02 mSv (2 mrem), which is well within the 0.25 mSv (25 mrem) criterion specified in 10 CFR 72.104 for maximum permissible annual whole body dose to any real individual. This dose represents about 0.7 percent of the natural background radiation dose in the United States (see Table 3.18), and is equivalent to an LCF risk of 1×10^{-6} or about one chance in a million of developing a fatal cancer from one year of operations. Because the nearest resident in Wyoming is closer than the nearest resident in Skull Valley, the radiological doses from accidents in Wyoming would be higher than those described in Section 4.7.2 for accidents in Skull Valley. However, the radiation doses would still be well within regulatory limits. The radiological impact to the nearest resident in Wyoming would therefore be small.

7.3.8 Other Impacts

7.3.8.1 Noise

Noise impacts from the construction and operation of an ISFSI at the Wyoming site would be expected to be similar to those of the proposed PFSF. Because a greater number of people live in closer proximity to the Wyoming site (as compared to the population around the Skull Valley site), noise may be more annoying, and annoy a greater number of people, at the Wyoming site. On the other hand, background noise in a small community would be appreciable greater than in the relatively unpopulated, extremely quiet area near the location being considered in Skull Valley; this would reduce impacts of some noises with respect to the existing environment.

7.3.8.2 Scenic Qualities

Construction and operation of the ISFSI at the Wyoming site would result in similar types of changes to the landscape as at the Skull Valley site (see Section 4.8.2). Facility construction and operation at the Wyoming site would have the direct impact of changing the scenic quality of the area by introducing an industrial presence into a largely undeveloped landscape, although areas close to the Wyoming site are more developed than Skull Valley in Utah. Facility construction would create the short-term visual impacts of additional dust from the operation of heavy equipment on-site and additional vehicle traffic on local roads. Facility operation would create long-term visual impacts through the contrast of a large industrial facility with the surrounding landscape, the contrast of security lights with the surrounding darkness at night, and the generation of additional vehicle traffic on local roads.

The Wyoming site is surrounded by a larger residential population than the Skull Valley site, meaning that a larger number of residential viewers would be affected in Wyoming than in Skull Valley. Also, at the Wyoming site the facility would be located closer to the surrounding residential population than at the Skull Valley site. Thus, the facility would be more visible to surrounding residents in Wyoming than in Skull Valley. The Wyoming site, however, is not surrounded by elevated areas that are important for wilderness recreation such as the Deseret Peak Wilderness area in Utah. Although there are about 100,000 visitors annually to Boysen State Park (J. Van Dyke, ORNL, Oak Ridge, Tenn., personal communication with Dave Wilson, Boysen State Park Superintendent, Riverton, Wy., Sept. 26, 2000), most of the recreation activities take place within areas where the proposed facility would not be visible—because of the difference in elevation and the distance of the proposed facility [5 km (3 miles)] from the recreational areas. The Wyoming site would be visible to traffic along Highways 20 and 26, which go to the south and west of the site. These highways have considerably more traffic than the Skull Valley Road; and, therefore, more motorists would have views of the Wyoming site than of the Skull Valley site.

7.3.8.3 Recreation

Most of the recreation in the area takes place in Boysen State Park which has about 100,000 visitors annually (J. Van Dyke, ORNL, Oak Ridge, Tenn., personal communication with Dave Wilson, Superintendent, Boysen State Park, Riverton, Wy., Sept. 26, 2000). The main recreation opportunities are water activities including fishing and boating on the Boysen Reservoir and the Wind River north of the reservoir. The proposed facility would not be visible to most of the recreation activities.

7.4 Impacts of Constructing and Operating SNF Transportation Facilities Near the Wyoming Site

The impacts of constructing and operating SNF transportation facilities in Skull Valley, Utah, are discussed in Chapter 5. The greatest difference between the Skull Valley site and the Wyoming site is the amount of land that would need to be cleared for the rail access corridors. In Skull Valley, approximately 314 ha (776 acres) would be cleared and graded, with approximately 63 ha (155 acres) being permanently cleared (i.e., for the life of the project). In comparison, the Wyoming site would only involve the clearing of approximately 10 ha (24 acres) for transportation facilities. In addition, the amounts of soil disturbance and construction material required for the 1.6-km (1-mile) rail line in Wyoming would be significantly less than for the 51-km (32-mile) rail line in Skull Valley.

Construction impacts for the rail line would be similar to those described in Section 7.3 for the SNF storage facility itself. Only in the areas of ecological resources and human health would the impacts for the rail access corridor differ substantively from what is presented in Section 7.3. These impacts are discussed below.

7.4.1 Ecological Resources

Impacts to ecological resources at the alternative site in Wyoming would be similar to those of the proposed action in Skull Valley which are predicted to be small with the application of appropriate mitigation measures.

Vegetation. The potential impacts on vegetation of constructing and operating transportation facilities for an ISFSI located near Shoshoni, Wyoming, would be small. They would be very similar to those associated with a facility located in Skull Valley, Utah as discussed in Section 5.4. However, a smaller amount of land would need to be cleared in Wyoming for transportation facilities. A new rail access corridor would be developed that would be less than 1.6 km (1 mile) long. Assuming that the width cleared for the rail corridor would be the same as in Skull Valley [i.e., 61 m (200 ft)], a maximum of about 10 ha (24 acres) would be cleared. Thus, based primarily on the need to clear less land for the project at the Wyoming site, the impact on vegetation would appear to be lower in Wyoming than for the proposed rail line in Skull Valley.

Wildlife. The greatest difference between the proposed action in Skull Valley and the Wyoming alternative is the amount of land cleared for the rail lines. In Skull Valley, approximately 314 ha (776 acres) would be cleared and graded, with approximately 63 ha (155 acres) being cleared for the life of the facility. The Wyoming site, in comparison, would involve the clearing of a maximum of only 10 ha (24 acres). This means that less wildlife habitat would be lost with the Wyoming alternative. This difference is unlikely to be significant, however, because predicted impacts for the Skull Valley transportation proposal, with the application of appropriate mitigation, would be small.

Wetlands. Impact on wetlands from a new rail line located near Shoshoni, Wyoming, would be small, because the wetland in the area (see Section 7.3.4) would be avoided.

Perennial and ephemeral streams. Impact on streams from a new rail line located near Shoshoni, Wyoming, would be small, because no streams would be crossed by the rail route.

Threatened, endangered, and other species of special concern. Impacts on plant and wildlife species of special concern would be small as none are known to be located in the area to be used for transportation facilities.

7.4.2 Human Health Impacts

The potential human health impacts resulting from construction and operation of transportation facilities at the Wyoming site, as well as the impacts (including possible transportation accidents) during the cross-country transportation of SNF to Wyoming, are discussed in this section. The human health impacts associated with construction and operation of an SNF storage facility at the Wyoming site are discussed in Section 7.3.7.

7.4.2.1 Non-Radiological Impacts

Potential worker injuries during construction and operations. Potential health impacts to workers during construction and operation of the new rail line in Wyoming would be similar to those described and analyzed in Section 5.7.2 for the Skull Valley site, with the exception that only about 1.6 km (1 mile) of new rail line would need to be constructed to access the Wyoming site. Non-radiological health impacts would, therefore, be even smaller than the impacts for a rail corridor in Skull Valley, which have been determined to be small (see Section 5.7.2).

Direct impacts and risks of cross-country transportation of SNF. The non-radiological risks for shipments of SNF to and away from the Wyoming site would be similar to those for the proposed PFSF in Skull Valley. The impacts of such shipments to and from Skull Valley are discussed in Section 5.7.2.

The average distance by rail from nuclear power reactors east of the Wyoming site is 2,856 km (1,775 miles). If each SNF train travels an average of 2,856 km (1,775 miles), the total distance covered by the trains for the entire campaign for shipping 4,000 SNF canisters (at one per railcar) to the facility would equal 11.4×10^6 railcar-km (7.1×10^6 railcar-miles). For trains eventually transferring casks away from the Wyoming site to a permanent repository, the rail distance is estimated to be 2,201 km (1,368 miles). Thus, the total distance covered by trains in transferring all 4,000 canisters to the national repository (at one canister per railcar) would be 8.8×10^6 railcar-km (5.5×10^6 railcar-miles). Therefore, the total distance associated with the entire lifetime set of operations (i.e., both receiving SNF at and shipping SNF from the Wyoming ISFSI) would be 20.2×10^6 railcar-km (12.6×10^6 railcar-miles). A round-trip calculation is included in this analysis to provide an upper bound on the number of railcar-km. The round-trip distances for the lifetime set of operations would then be 40.4×10^6 railcar-km (25.2×10^6 railcar-miles).

Using the equations in Section 5.7.1.2, the direct, non-radiological transportation risks associated with the Wyoming site would be:

$$(4.26 \times 10^{-8} \text{ injuries/railcar-km}) \cdot (40.5 \times 10^6 \text{ railcar-km}) = 1.72 \text{ injuries, and} \\ (2.27 \times 10^{-8} \text{ fatalities/railcar-km}) \cdot (40.5 \times 10^6 \text{ railcar-km}) = 0.92 \text{ fatalities}$$

over the 40-year assumed lifetime (original license plus 20-year renewal) of the facility.

As was discussed in Section 5.7.1.2, Saricks and Kvitek (1994) noted that dedicated trains—such as would be used to transport SNF—spend much less time in rail yards than do regular trains, since dedicated trains do not undergo classification. Thus, it appears that the injuries and fatalities based on national averages are not as relevant for dedicated trains as they are for regular trains. Should the large portion of casualties which occur in rail yards be excluded from the national averages, the injury rate would decrease by a factor of almost 7 and the fatalities would decrease by a factor of about 36.

Indirect impacts and risks of cross-country transportation of SNF. The methods of assessing indirect impacts (including latent mortality from atmospheric emissions of locomotives) are discussed in Section 5.7.1.3. Such impacts associated with an SNF storage facility in Wyoming would be similar to those for the proposed PFSF in Skull Valley. Again, the difference would be primarily in the distance to a national repository for shipments leaving the proposed storage facility.

Using the equations in Section 5.7.1.3, the indirect, non-radiological transportation risk associated with the Wyoming site would be:

$$(1.3 \times 10^{-7} \text{ latent fatalities/train-km}) \cdot (40.5 \times 10^6 \text{ railcar-km}) \\ \div (4 \text{ railcars per train}) = 1.32 \text{ latent fatalities,}$$

if it is assumed that the total population along the rail routes is “urban.” This is a very small risk over the assumed 40-year lifetime (original license plus 20-year renewal) of the proposed facility.

7.4.2.2 Radiological Impacts

The radiological human-health impacts of transporting SNF would include exposure of the public and transportation workers (e.g., the train crew) to ionizing radiation, thereby resulting in members of the general public and the workers receiving a radiation dose. The radiological impacts of spent fuel transportation presented in this section include estimates of dose from incident-free transportation of SNF and from potential SNF transportation accidents. As described below, these impacts would be expected to be small.

For cross-country transportation to the alternative ISFSI site in Wyoming, only shipments by rail are analyzed because of the size and weight of the shipping casks that are proposed for use by PFS. This FEIS also evaluates the impacts of transporting SNF from the Wyoming site to a permanent repository. A Draft Environmental Impact Statement prepared by DOE (see DOE 1999) addresses in detail the national and regional transportation impacts of building and operating a proposed permanent repository at Yucca Mountain, Nevada. Congress, in the Nuclear Waste Policy Act, as amended (NWPA), has directed the DOE to study one candidate repository, namely, a repository proposed at Yucca Mountain, Nevada. To reflect the provisions of the NWPA, the NRC staff has examined the shipment of SNF via rail from the proposed PFSF, on its way to a permanent repository in the western United States, as if such a repository were located at Yucca Mountain, Nevada, although that location may or may not become the actual repository. Accordingly, the NRC staff examined the shipment of SNF via rail from the alternative Wyoming site to the Utah-Nevada border.

Summary of findings. The annual radiological impacts (as measured by public doses and their corresponding LCF risk values) of transporting SNF to the alternative site in Wyoming are summarized in Tables 7.4 and 7.5. For the maximally exposed individual (MEI) (see Section 5.7.2.4) along this route, the dose would be 1.1×10^{-6} Sv (1.1×10^{-4} rem) annually or 2.2×10^{-5} Sv (2.2×10^{-3} rem) for the shipment of 4,000 casks over a 20-year period. The corresponding risk to this MEI would be an LCF of 5.5×10^{-8} and 1.1×10^{-6} , respectively. The impacts of transporting SNF to the Wyoming site are similar to the all-rail impacts of transporting SNF to the proposed PFSF in Skull Valley.

Table 7.4. Doses associated with SNF shipments from the Maine Yankee reactor to the alternative site in Wyoming

Incident-free dose [person-Sv (person-rem)]		Accident dose to public [person-Sv (person-rem)]
Transportation crew	Public	
Annual—200 casks per year		
0.0113 (1.13)	0.0854 (8.54)	0.0365 (3.65)
20-year campaign—4,000 casks		
0.226 (22.6)	1.71 (171)	0.73 (73)

Table 7.5. Radiological risks associated with SNF shipments from the Maine Yankee reactor to the alternative site in Wyoming

Incident-free risk (LCF)		
Transportation crew	Public	Accident risk to public (LCF)
Annual—200 casks per year		
4.52×10^{-4}	4.27×10^{-3}	1.83×10^{-3}
20-year campaign—4,000 casks		
9.04×10^{-3}	8.54×10^{-2}	3.65×10^{-2}

Tables 7.6 and 7.7 show the public doses and corresponding LCF risk values for shipments of SNF away from the Wyoming site to the Utah-Nevada border. For the MEI (see Section 5.7.2.4) along this route, the dose would be 5.5×10^{-7} Sv (5.5×10^{-5} rem) annually or 1.1×10^{-5} Sv (1.1×10^{-3} rem) for 4,000 casks over a 20-year period. The corresponding risk to this MEI would be an LCF of 2.75×10^{-8} and 5.5×10^{-7} , respectively. While the doses along this route would be small for the Wyoming site, they would be higher than for similar shipments from the proposed PFSF in Skull Valley due to the shorter route length and lower population densities for the route from Skull Valley.

Table 7.6. Doses associated with SNF shipments from the alternative site in Wyoming to the Utah-Nevada border

Incident-free dose [person-Sv (person-rem)]		Accident dose to public [person-Sv (person-rem)]
Transportation crew	Public	
Annual—200 casks per year		
0.004 (0.40)	0.0071 (0.71)	0.0042 (0.42)
20-year campaign—4,000 casks		
0.08 (8.00)	0.14 (14.2)	0.084 (8.40)

Table 7.7. Radiological risks associated with SNF shipments from the alternative site in Wyoming to the Utah-Nevada border

Incident-free risk (LCF)		
Transportation crew	Public	Accident risk to public (LCF)
Annual—200 casks per year		
1.60 × 10 ⁻⁴	3.55 × 10 ⁻⁴	2.10 × 10 ⁻⁴
20-year campaign—4,000 casks		
3.20 × 10 ⁻³	7.10 × 10 ⁻³	4.20 × 10 ⁻³

Approach to the analysis. The approach to the analysis of transportation risks, including descriptions of the models used and the assumptions employed, is discussed in Section 5.7.2. This same analytical approach is used for SNF transportation involving the Wyoming site. As was done in Section 5.7.2 for the Skull Valley analyses, it was assumed that each shipment of SNF to the Wyoming site would travel from the Maine Yankee reactor (in the state of Maine) and would pass through many of the high-population northeast and midwest transportation corridors.

All casks and conditions for the incoming SNF shipments [e.g., 4 casks per train, 50 trains per year, 200 casks per year, external dose rate from the cask of 0.13 mSv/hr (13 mrem/hr) at 1 m (3 ft), etc.] were assumed to be the same as for the analysis in Section 5.7.2 for the proposed PFSF in Skull Valley.

The analyses were performed using RADTRAN4 with 1990 census information. Since these shipments would not be initiated until the first part of this century, the population exposures were increased by 30 percent to account for the anticipated increase in the general population between the years 1990 and 2020 (see Section 5.7.2.3).

The Wyoming site is located approximately 1.6 km (1 mile) south of the existing Burlington Northern Santa Fe railway main line that runs through the central part of Wyoming. The route from Maine Yankee to the Wyoming site would be approximately 3,927 km (2,440 miles) long and would pass through major cities, such as Portland, ME, Buffalo, NY, Cleveland, OH, Chicago, IL, and other cities enumerated in Section 5.7.2.3 of this FEIS. (This compares to 4,476 km (2,781 miles) from Maine Yankee to the proposed Skull Valley site.) The route is illustrated in Figure 7.3 and is described in detail in Appendix C of this FEIS. Due to the number of nuclear power reactors in the eastern United States, most SNF shipments would approach the Wyoming site from the east through central Nebraska and into Wyoming. The population densities and route fractions for the Maine Yankee-to-Wyoming route are shown in Table 7.8.

Table 7.8. Data characteristics for the route from the Maine Yankee reactor to the Wyoming site

Parameter	Data value
Route length	3,927 km (2,440 miles)
Urban fraction	0.04
Suburban fraction	0.25
Rural fraction	0.71
Urban population density	2,383 people/km ² (6,170 people/mile ²)
Suburban population density	333 people/km ² (862 people/mile ²)
Rural population density	10 people/km ² (26 people/mile ²)

Shipments to a final repository. SNF stored at the Wyoming site would be shipped to a permanent repository. DOE has examined various options to receive rail shipments of SNF at the proposed Yucca Mountain repository ranging from the construction of a new rail line to the use of heavy-haul vehicles from intermodal facilities along existing rail routes in Nevada. Because DOE has not yet made a decision, and the proposed Yucca Mountain repository has not been approved or reviewed by the NRC staff, this study examines only the shipment of SNF from the Wyoming site to the Utah-Nevada border.

The route is illustrated in Figure 7.4 and is discussed in detail in Appendix C of this FEIS. The route would pass through major western cities, such as Cheyenne, WY, Ogden, UT, and Salt Lake City, UT.

Wyoming and regional impacts. This analysis also included the impacts of transporting SNF in the region (i.e., considered to be in and near Wyoming). To analyze the regional impacts, the INTERLINE routing model (see Appendix C) was used to examine possible rail access routes to the Wyoming site. Four such routes were identified. The distances of these routes ranged from 350 to 400 km (220 to 250 miles). The routes are illustrated in Figure 7.5.

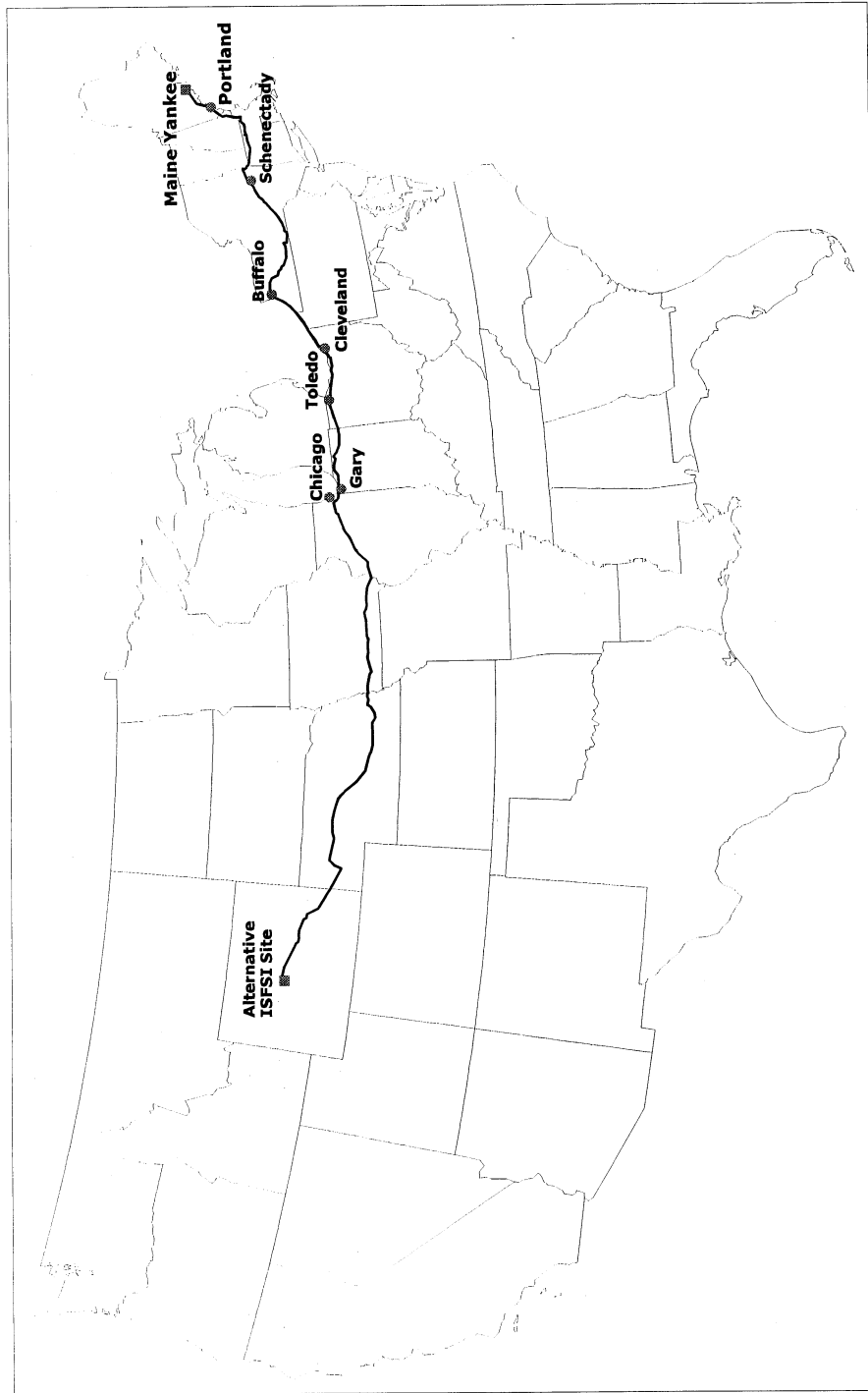


Figure 7.3. Potential cross-country rail route from the Maine Yankee nuclear power plant to Fremont County, Wyoming.

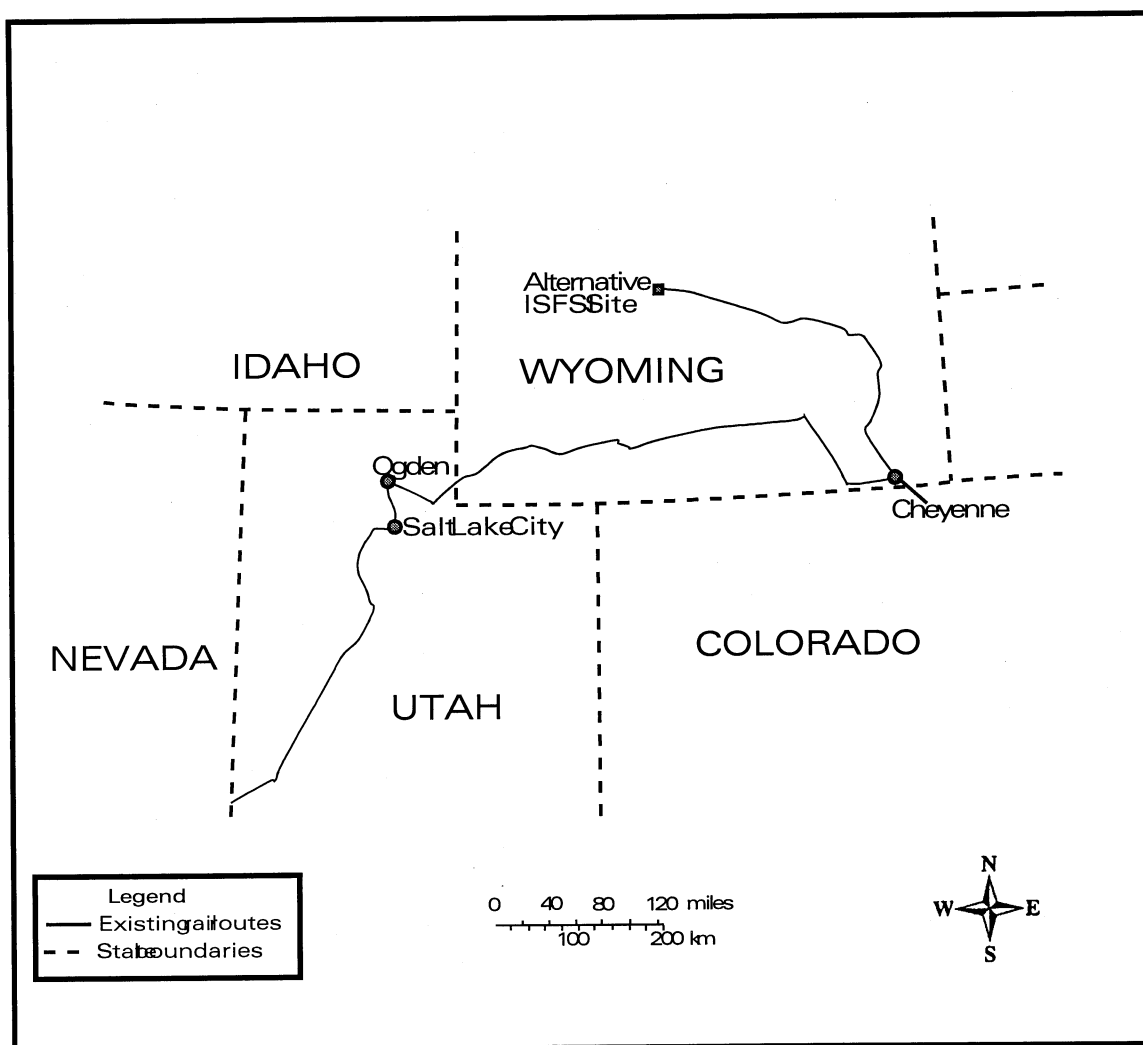


Figure 7.4. Potential rail route from the Fremont County, Wyoming, site to the Utah-Nevada border.

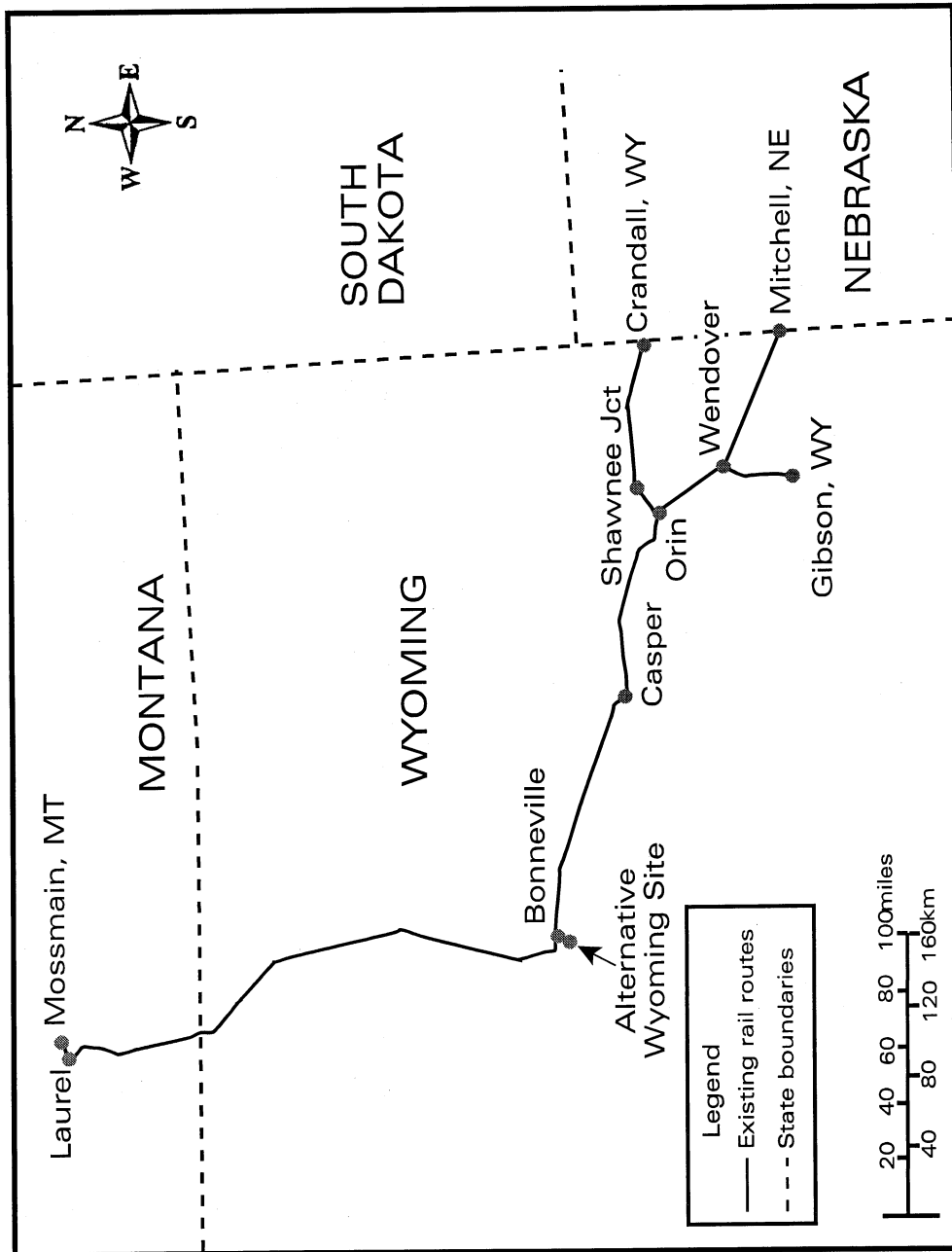


Figure 7.5. Potential rail routes for shipping spent nuclear fuel to Fremont County, Wyoming.

In estimating the potential radiological impacts, the NRC staff conservatively assumed that all 200 casks to be shipped annually, as well as the entire 40,000 MTU to be shipped over the lifetime of the facility, would be shipped along each of the four possible routes to and from the facility. The radiological impacts from transportation of SNF along these routes are summarized in Table 7.9. For a detailed discussion of the regional analysis, see Appendix D. From these results, it can be concluded that the overall radiological impact is small and would be similar to the radiological impact for transportation of SNF to and from Skull Valley.

7.5 Environmental Justice Considerations Near the Wyoming Site

The NRC staff examined the geographic distribution of minority and low income populations within 80 km (50 miles) of an SNF storage facility at the Wyoming site. 1990 U.S. Census data were used to identify minority and low-income populations near the Wyoming site in the same manner as at the preferred site (Site A in Skull Valley).

7.5.1 Demographics

7.5.1.1 Minority populations

The significant minority populations near the proposed Wyoming alternative site are Native Americans who reside on and near the Wind River Reservation. This is illustrated in Figure 7.6, which highlights the geographic distribution of Census block groups meeting the criteria for minority populations in the 1990 U.S. Census within 80 km (50 miles) of the Wyoming site. The nine block groups satisfying these criteria are located within the shaded area generally indicated by the heavy arrows.

Minority populations near the Wyoming site were identified using the same criteria applied in Section 6.2.1 for the Skull Valley site (i.e., where the minority population exceeds 50 percent or where the percentage of the minority population of the impact assessment area is at least 20 percentage points greater than the minority population percentage in the geographic area of study). As in the environmental justice analysis performed for the preferred site in Skull Valley, the impact assessment area for the Wyoming site also was expanded to 80 km (50 miles) to examine transportation routes into the facility and the percentage criterion. The percentage criterion was left at 20 percentage points; however, the NRC staff examined a 10 percentage point difference to see if additional relatively small pockets of low income and minority residences could be identified.

Table 7.10 shows these data. Similar to the outcome for the Skull Valley analysis, relaxing the criteria would have expanded the number of block groups counted as minority block groups from 9 to 18, but would not have significantly changed the picture of their location. These additional block groups tend to be adjacent to those already identified using the 20-percentage point criteria. One minority block group is located immediately south of the Wyoming site (Tract 9825, Block Group 3) (see Figure 7.6).

Table 7.9. Summary of the cumulative annual and 20-year campaign risks (as measured by latent cancer fatalities) for the shipment of spent nuclear fuel by rail to the alternative Wyoming ISFSI site

To the Wyoming site from:	Annual risks (LCFs) from 1 year rail shipments				Risks (LCFs) from 20 years of rail shipments			
	Incident-free risk		Accident risk		Incident-free risk		Accident risk	
	Crew	Public	Crew	Public	Crew	Public	Crew	Public
Crandall, WY	2.30×10^{-4}	7.30×10^{-5}		3.60×10^{-5}	4.61×10^{-3}	1.46×10^{-3}		7.20×10^{-4}
Gibson, WY	2.31×10^{-4}	7.65×10^{-5}		3.69×10^{-5}	4.62×10^{-3}	1.53×10^{-3}		7.38×10^{-4}
Mitchell, NE	2.34×10^{-4}	7.95×10^{-5}		3.76×10^{-5}	4.67×10^{-3}	1.59×10^{-3}		7.52×10^{-4}
Mossmain, MT	2.31×10^{-4}	4.42×10^{-5}		1.28×10^{-5}	4.62×10^{-3}	8.84×10^{-4}		2.56×10^{-4}

Table 7.10. Minority and low-income block groups within 80 km (50 miles) of the alternative site in Fremont County, Wyoming
(Boldface entries = 20 percent criterion; Italicized entries = 10 percent criterion)

County and tract	Block group	Persons	Below poverty level (percent)	Total whites (percent)	Black (percent)	Native American (percent)	Asian and Pacific Islander (percent)	Other (percent)	Hispanic (all races) (percent)	Minorities (racial minorities plus white hispanics) (percent)
State of Wyoming		453,588	11.9	94.2	0.7	2.2	0.6	2.3	5.5	8.9
Threshold for environmental justice concern		—	31.9	—	20.7	22.2	20.6	22.3	25.5	28.9
Washakie										
9902	5	18		83.3	0.0	16.7	0.0	0.0	16.7	
Hot Springs										
9877	4	116	16.0	74.1	0.0	25.0	0.0	0.9	1.7	29.1
9877	5	24	0.0	79.2	0.0	0.0	0.0	20.8	20.8	20.8
Fremont										
9825	1	143	30.5	95.1	0.0	0.0	0.0	4.9	6.3	5.6
9825	3	17	0.0	64.7	0.0	0.0	0.0	35.3	35.3	35.3
9826	2	30	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
9828	1	617	30.0	83.5	0.2	14.3	0.2	1.9	3.4	18.2
9828	2	362	32.1	80.9	0.0	16.9	0.6	1.7	4.4	20.4
9829	2	81	40.8	98.8	0.0	0.0	0.0	1.2	1.2	1.2
9831	4	369	15.1	79.7	0.0	19.5	0.0	0.8	1.9	23.1
9832	1	604	76.4	24.0	0.0	74.2	0.0	1.8	4.3	76.0
9832	2	1,135	44.6	15.8	0.2	82.9	0.0	1.1	5.6	84.2
9832	3	669	24.7	44.4	0.0	53.7	0.1	1.8	3.4	55.6
9832	4	1,632	42.9	5.3	0.3	93.9	0.0	0.5	3.0	94.7
9832	5	1,199	39.3	12.1	0.0	87.5	0.1	0.3	6.1	89.7
9832	6	204	56.3	21.1	0.5	73.5	0.0	4.9	10.8	78.9
9832	7	269	23.7	66.2	0.0	33.5	0.4	0.0	1.9	33.8
9833	1	626	23.6	90.1	1.6	5.4	0.3	2.6	3.7	9.9
9833	4	692	34.3	79.6	0.3	17.3	0.0	2.7	5.8	23.9
9833	5	603	19.8	84.2	0.3	11.1	0.2	4.1	14.1	25.2
9833	6	673	39.1	81.9	0.0	10.8	0.3	7.0	13.2	18.1
9834	3	292	31.3	96.6	0.0	2.7	0.7	0.0	6.5	11.0
9834	4	240	49.6	85.0	0.0	12.5	0.0	2.5	3.8	17.7
9834	5	613	22.1	84.5	0.0	10.0	0.3	5.2	10.6	20.0

Native Americans reside principally on the northern and southern thirds of the Wind River Reservation, several miles to the west of the Wyoming site. Although the largest minority group in Fremont County is Native American, the minority block group nearest to the proposed PFSF site is an Hispanic community (Tract 9825, Block Group 3). This block group is approximately 1.6 km (1 mile) from the site and stretches from immediately south of the site to the east and southeast. No other significant minority populations were identified in any census block group either close to the Wyoming site or along the proposed transportation corridors into the site. This indicates that other minority populations are either well-mixed into the majority population, or that other minority populations are too small to be captured in the census data. The Native Americans on the northern and southern thirds of the Wind River Reservation and the Hispanic community near the Wyoming site represent the minority populations that have the potential to experience high and adverse impacts and, therefore, warrant consideration in an environmental justice evaluation.

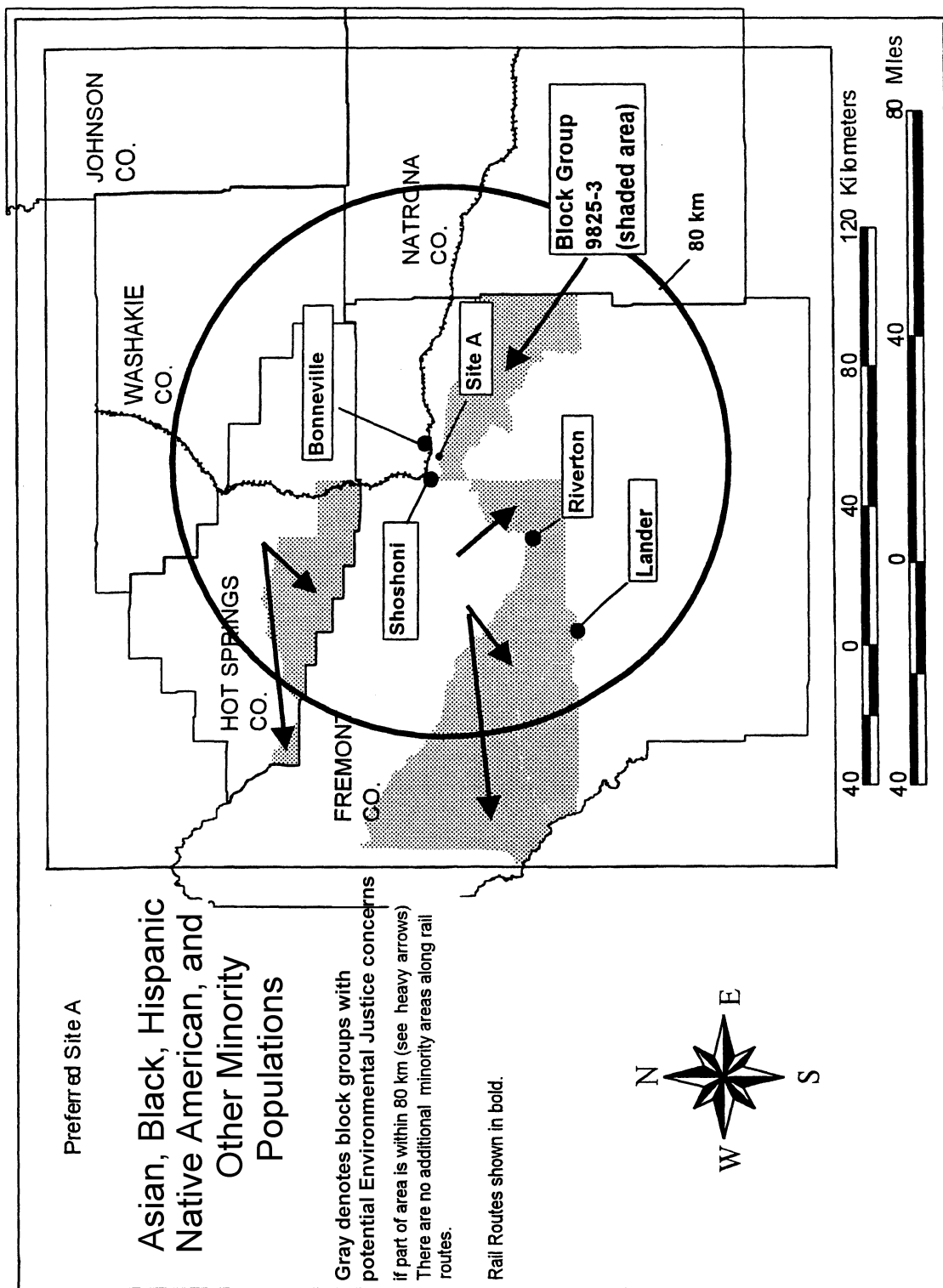


Figure 7.6. Geographic distribution of minority census block groups within 80 km (50 miles) of the alternative site in Fremont County, Wyoming.

7.5.1.2 Low-Income populations

Figure 7.7 shows the distribution of low-income populations for the impact assessment area out to 80 km (50 miles) from the Wyoming site by shading, open circles (for small block groups), and heavy arrows. These are disproportionately the residents of the Wind River Reservation. Both within and beyond 80 km (50 miles), the principal low-income areas appear to correspond mainly with the local Native American communities. Although there are several low-income populations within 80 km (50 miles), no low-income community is within 6 km (4 miles) of the Wyoming site.

7.5.2 Assessment of Impacts

Because the impacts from the construction and operation of the proposed ISFSI at the Wyoming site would be generally similar to those incurred at the Skull Valley site, any negative environmental justice impacts of the Wyoming alternative are expected to be similar in scope and type to those at the Skull Valley site with the following principal exceptions. First, because the Wyoming site is on private land, the Native Americans on the Wind River Reservation will not have the opportunity to benefit from lease payments, although it is possible that they could benefit from employment at the site. Second, while it is not clear if Native Americans or other minority and low-income groups use the area in the vicinity of the Wyoming site for subsistence activities, there is very little use of the area near the privately-owned Wyoming site for cultural or subsistence purposes. The impact on cultural resources or activity or subsistence activity of the Wyoming alternative likely would be small. Thus, no disproportionately high and adverse impact would occur to minority and low-income communities at the Wyoming site. Considering the positive and negative impacts from the proposed PFSF, the Wyoming alternative is not significantly different from the preferred site in Skull Valley from an environmental justice perspective.

7.6 Comparison of the Skull Valley, Utah, and Wyoming Sites

Table 7.11 compares the potential impacts of constructing and operating an SNF storage facility (and its associated transportation facilities) in Wyoming with those of such a facility and rail line facilities in Skull Valley, Utah. Note that NRC has no authority to decide the location of the proposed PFSF; NRC's decision, as described above, is either to grant or deny PFS's license application for the Skull Valley location. The Wyoming site is evaluated in this FEIS for the purpose of comparing potential impacts against the proposed PFSF in Skull Valley. Because a detailed design for an ISFSI in Wyoming does not exist, and because the Wyoming site has not been studied in as great detail as the Skull Valley site, an exact one-to-one comparison of potential impacts is not possible for each resource category. The conclusions regarding the evaluation of the Skull Valley site versus the Wyoming site are therefore made from the perspective of determining whether the Wyoming site is obviously superior to the Skull Valley site for the purpose of constructing and operating the proposed PFSF.

With two possible exceptions (as discussed below), the potential impacts for an SNF storage facility at the site in Fremont County, Wyoming, would be similar to those for the proposed PFSF in Skull Valley. The exceptions include: impacts associated with the local transportation options and impacts to the Skull Valley Band. Each of these exceptions is discussed below.

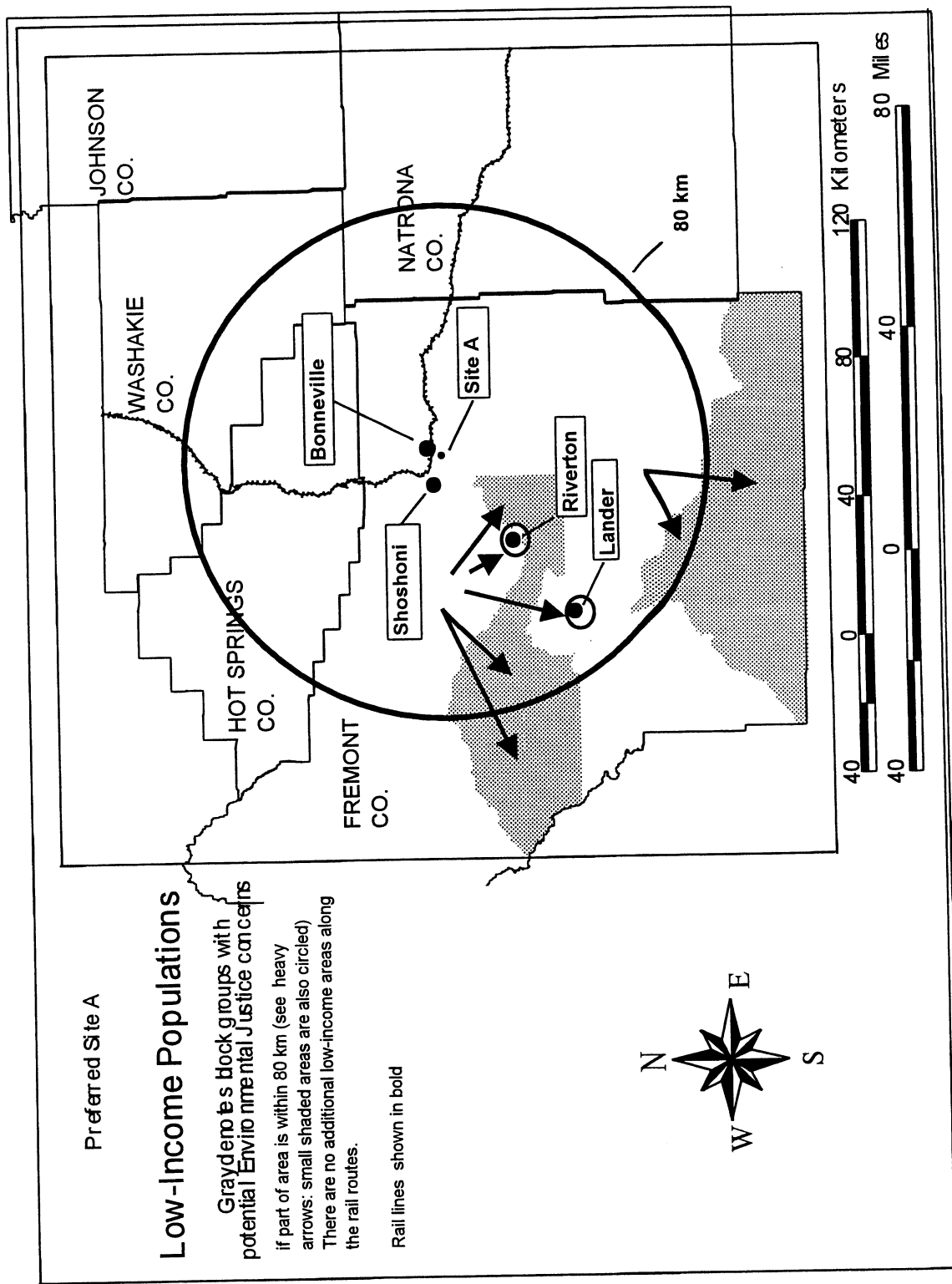


Figure 7.7. Geographic distribution of low-income census block groups within 80 km (50 miles) of the alternative site in Fremont County, Wyoming.

Construction and operation of an ISFSI at the Wyoming site would cause fewer impacts than at the Skull Valley site in regard to land use, disturbance of wildlife habitat, and the required amounts of construction materials related to the construction of a new rail access corridor. Because of the greater distance from existing rail service to the proposed PFSF in Skull Valley, significantly larger amounts of land, which is public land administered by the BLM, would be needed for a new rail transportation corridor in Skull Valley than would be required for the Wyoming alternative (which lies entirely on privately-owned land). The Wyoming site would require only about 1.6 km (1 mile) of new rail line, compared to 51 km (32 miles) in Skull Valley. Thus, a considerably larger amount of habitat associated with the rail line would be disturbed in Skull Valley than would be disturbed near the Wyoming site. The other adverse impacts of constructing a new rail line in Skull Valley would also be absent for an SNF storage facility at the Wyoming site. These impacts include the use of railbed ballast and aggregate, as well as the increased road use of vehicles transporting these construction materials.

If the proposed PFSF were not constructed on the Reservation, then its positive economic benefits would not accrue to the Skull Valley Band. The Tribe would be free to pursue other uses for their land, but would lose opportunities for employment, as well as the financial gain from the proposed lease.

In regard to all other potentially affected resources, neither the Skull Valley site nor the Wyoming site appears to be appreciably different. In numerous respects, the Wyoming site appears to have smaller impacts than those at the proposed Skull Valley site, primarily due to the much shorter rail line that would need to be constructed. In several respects, however, impacts at the Wyoming site may be greater than at the Skull Valley site, primarily due to its close proximity to the nearest resident and nearby population centers. None of these differences, however, appears to be significant. Therefore, based on the above, the NRC staff concludes that the construction and operation of an ISFSI at the Wyoming site is not an obviously superior alternative to the proposed action.

Table 7.11. Summary and comparison of potential environmental impacts between an SNF storage facility at the Skull Valley, Utah, site and at the Fremont County, Wyoming site

Site A in Skull Valley with a new rail line (i.e., the proposed action)	Alternative site in Wyoming ^a
Geology, Soils, and Mineral Resources	
SMALL. Impacts to soils and economic geologic resources could occur from construction and operation of the proposed PFSF and the rail line. A small percentage of the soils in the valley would be permanently lost in the soil/cement mixture. Excess soils would not be generated. Aggregate materials used for construction are readily available locally and would be recoverable in decommissioning. Underlying mineral resources would be unavailable during operation.	Like the proposed site (Site A in Skull Valley), the impacts to soils and economic geologic resources will occur. Because a much shorter rail line would be required at the Wyoming site, soils disturbance and geologic resource commitments would be less than at the proposed Skull Valley site. Impacts from the unavailability of mineral resources beneath the site would be the same as for the proposed site.
Surface Water	
SMALL. Some modification of surface drainage patterns could occur; however, there would be no adverse effects during normal weather conditions.	There would be less interaction of the site footprint and access routes with surface runoff channels at the Wyoming site as compared to the Skull Valley site.
Flooding	
SMALL TO MODERATE. Severe flooding conditions, if they occur during construction of the proposed PFSF, could cause erosion of disturbed soil and unvegetated embankments and would create downstream siltation. Potential impacts to the rail line under severe flooding events would be similar to those described above for the PFSF.	Potentially smaller impacts from watershed-scale flooding than at the Skull Valley site.
Water Use	
SMALL. Most water required for construction would be purchased from commercial suppliers. On-site groundwater use would involve small quantities.	Less water would be required for construction at the Wyoming site because of a much shorter rail access corridor than in Skull Valley.
Groundwater	
SMALL. Little to no potential for impacts to other groundwater users or to groundwater quality.	Residential wells are known to exist within 1.6 km (1 mile) of the Wyoming site. Groundwater quantity may be affected, although this could be mitigated by use of commercial water sources.
Air Quality	
SMALL TO MODERATE. Large amounts of fugitive dust from earth disturbance would occur during construction of the storage facility, and of the rail line where it runs close to Interstate 80. Air quality impacts would be small for the storage facility, and moderate (similar to a large road construction project) for the rail line construction near Interstate 80, where small effects might be experienced by large numbers of people. Air quality impacts during operation from up to two locomotives, vehicles, and a backup generator would be small.	Impacts at the Wyoming site are likely to be greater than those at the Skull Valley site due to the proximity of construction areas to the nearest residence and nearby population centers in the vicinity of the Wyoming site.

Table 7.11 (continued)

Site A in Skull Valley with a new rail line (i.e., the proposed action)	Alternative site in Wyoming ^a
Terrestrial Ecology	
<p>Vegetation. SMALL. Clearing of approximately 408 ha (1,008 acres) of land for construction of the proposed facility and associated rail line would result in loss of existing degraded desert shrub/saltbush vegetation dominated by non-native cheatgrass. About 71 percent of this area would be replanted with native species or crested wheatgrass.</p>	<p>The impacts to vegetation for a facility in Wyoming would be similar to those for a facility in Skull Valley. The amount of vegetation disturbed by clearing would be considerably less than for the proposed action because the rail line would be much shorter.</p>
<p>Wildlife. SMALL. Construction of the proposed facility and rail line would disturb 408 ha (1,008 acres) of wildlife habitat, but 71 percent of this area would be re-planted to native species and crested wheatgrass which may provide improved habitat for some species. Fences around the proposed facility and the raised rail bed would be expected to alter movement patterns of larger animals, but such impacts should be small if BLM-recommended mitigation to provide crossings of the rail line are implemented. Operation of the proposed facility could result in radiation exposure to some species that might be in close proximity to the casks (e.g., birds and small animals); these exposures, however, would be below stated criteria.</p>	<p>The impacts to wildlife for a facility in Wyoming would be similar to those for a facility in Skull Valley. Wildlife species that are present on the Wyoming site are similar to those at Skull Valley and would be affected in similar ways. Considerably less wildlife habitat would be affected because of the much shorter rail line required for the Wyoming site.</p>
<p>Wetlands. SMALL. No impacts to wetlands from construction of the proposed facility are anticipated because there are no wetlands on or near the preferred site or in the vicinity of the rail line and siding. A potential small impact to wetlands around Horseshoe Springs could result indirectly from increased recreational use by temporary construction workers.</p>	<p>The impacts to wetlands for a facility in Wyoming would be similar to those for a facility in Skull Valley. One wetland is known to occur on the Wyoming site, but it could be avoided if the project were to be located there.</p>
<p>Perennial and ephemeral streams. SMALL. No impacts to streams are expected to occur on the proposed site because there are no streams present. Because the proposed rail corridor would cross 32 streams with ephemeral flows, it is possible, depending on the time of year that construction occurs, that disturbed soils could create small short-term increases in the turbidity of any water in such streams. Such impacts are expected to be small.</p>	<p>The impacts to perennial and ephemeral streams for a facility in Wyoming would be similar to those for a facility in Skull Valley. Two ephemeral streams occur near the Wyoming site and two or three dry washes are within 1.6 km (1 mile) of the site.</p>

Table 7.11 (continued)

Site A in Skull Valley with a new rail line (i.e., the proposed action)	Alternative site in Wyoming ^a
<p>Threatened, endangered, and species of special concern. SMALL. No Federally or State-listed threatened or endangered plant species are known to occur on the proposed site or rail line. Federally and State-listed raptors (e.g., ferruginous hawk) and the BLM-listed loggerhead shrike are potentially present in Skull Valley. The rare Pohl's milkvetch, a BLM special status plant species, is potentially present near the site. Habitat for the BLM-listed kit fox and burrowing owl is present along the Skunk Ridge rail line and on the proposed PFSF site. No impacts would occur to Federally-listed threatened or endangered species. Impacts to State-listed species and to the species of special interest to BLM would be small.</p>	<p>The impacts to threatened and endangered species and State species of concern for a facility in Wyoming would be similar to those for a facility in Skull Valley. Owl Creek miner's candle, a plant species which has a declining population, occurs in the general area of the Wyoming site, and the ferruginous hawk, a State-listed species in Wyoming, is reported to use the site.</p>
Socioeconomics and Community Resources	
<p>Population. SMALL. The total increase in population amounts to approximately 0.6 percent of Tooele County's 1996 population during construction and less than that during operations. Because only Skull Valley Band members and their spouses may live on the Skull Valley Reservation, impacts on Reservation population will be small.</p>	<p>The Wyoming site is located in a remote, sparsely populated area, and the impacts to population of constructing and operating a facility at the Wyoming site are expected to be quantitatively similar to those at the remote Skull Valley site. Unlike Skull Valley, the Wyoming site is located on private land. Its development is expected to have no special impact on either the population or infrastructure of the Wind River Indian Reservation.</p>
<p>Housing. SMALL. The total increase in housing requirements amounts to approximately 26 percent of vacant housing units for sale or rent in 1990 for Tooele County during construction and approximately one-half that proportion during operations. Because only Skull Valley Band members and their spouses may live on the Skull Valley Reservation, impacts on Reservation housing will be small.</p>	<p>The Wyoming site is located in a remote, sparsely populated area, and the impacts to housing of constructing and operating a facility at the Wyoming site are expected to be quantitatively similar to those at the remote Skull Valley site. Unlike Skull Valley, the Wyoming site is located on private land. Its development is expected to have no special impact on either the population or infrastructure of the Wind River Indian Reservation.</p>
<p>Education. SMALL. The total increase in school-age children amounts to approximately 0.5 percent of the enrollment in 1997 for Tooele County during construction and somewhat less than that during operations. Because only Skull Valley Band members and their spouses may live on the Skull Valley Reservation, impacts on Reservation education will be small.</p>	<p>The Wyoming site is located in a remote, sparsely populated area, and the impacts to education of constructing and operating a facility at the Wyoming site are expected to be quantitatively similar to those at the remote Skull Valley site. Unlike Skull Valley, the Wyoming site is located on private land. Its development is expected to have no special impact on either the population or infrastructure of the Wind River Indian Reservation.</p>
<p>Utilities. SMALL. There may be some improvement to electrical service if upgrades are required for the proposed facility. The small number of in-moving workers would likely live in existing housing during construction and operations that would not require additional utility hookups. Because only Skull Valley Band members and their spouses may live on the Skull Valley Reservation, impacts on Reservation utilities will be small.</p>	<p>The Wyoming site is located in a remote, sparsely populated area, and the impacts to utilities of constructing and operating a facility at the Wyoming site are expected to be similar to those at the remote Skull Valley site. Unlike Skull Valley, the Wyoming site is located on private land. Its development is expected to have no special impact on either the population or infrastructure of the Wind River Indian Reservation.</p>

Table 7.11 (continued)

Site A in Skull Valley with a new rail line (i.e., the proposed action)	Alternative site in Wyoming ^a
<p>Solid and sanitary waste. SMALL. The actual quantities of solid wastes expected to be generated are small during both construction and operation of the proposed site and would be shipped to licensed landfills or to permitted low-level waste facilities, as appropriate. Spoils resulting from construction of the proposed facility and the proposed rail line would be reapplied for grading purposes, and vegetative wastes along the proposed rail line would be shredded and scattered in place. Because only Skull Valley Band members and their spouses may live on the Skull Valley Reservation, impacts on Reservation solid and sanitary waste will be small.</p>	<p>The Wyoming site is located in a remote, sparsely populated area, and the impacts to solid wastes of constructing and operating a facility at the Wyoming site are expected to be similar to those at the remote Skull Valley site. Unlike Skull Valley, the Wyoming site is located on private land. Its development is expected to have no special impact on either the population or infrastructure of the Wind River Indian Reservation.</p>
<p>Transportation and traffic. SMALL TO MODERATE. The period of greatest traffic impact would occur during the first 6–8 weeks of constructing the proposed facility, with a 130 percent increase in the use of Skull Valley Road for the movement of construction materials and workers resulting in delays along it. Impacts resulting from construction of the proposed rail siding and rail line would be minimal (accounting for only a 4.5 percent increase in traffic along Interstate 80) and would be spatially separate from impacts along Skull Valley Road. Impacts during operation of the proposed facility and use of the rail line for the movement of SNF would be substantially less than during construction.</p>	<p>The Wyoming site is located in a remote, sparsely populated area. The impacts to transportation of constructing and operating a facility at the Wyoming site are expected to be less than those at the remote Skull Valley site because of the Wyoming site's closer proximity to the railroad mainline.</p>
<p>Economic structure. SMALL TO MODERATE (but beneficial). Constructing the proposed facility and the proposed rail line would directly result in the creation of approximately 255 jobs during the peak of construction and approximately 45 jobs during operation. Construction and operation of the proposed facility would result in increased business for the Pony Express Convenience Store on the Reservation and for other businesses and suppliers in the area. There should be a large benefit to the Skull Valley Band in the form of lease payments for the duration of the proposed facility's operation.</p>	<p>The Wyoming site is located in a remote, sparsely populated area, and the impacts to economic structure of constructing and operating a facility at the Wyoming site are expected to be similar to those at the remote Skull Valley site except for those on the Skull Valley Band. Because this site is not on tribal trust land, the local Native American community would not benefit from lease payments, although members might benefit from employment because of the facility.</p>
<p>Economic benefits of the proposed project include State sales tax payments, local payroll, county incentive payments, and other expenditures. Sales tax payments to the State of Utah are estimated to be \$53.5 million, while incentive payments to Tooele County are estimated to be \$91 million over the life of the project. Local payroll during operation of the proposed PFSF is estimated to be \$81 million. Other local expenditures, including operations support and utilities, are estimated to be \$70 million. The construction of steel liners for the storage casks could be accomplished locally or in Salt Lake City and could add an additional \$747 million to anticipated local expenditures.</p>	<p>Economic benefits similar to those identified for a facility in Skull Valley would be expected to accrue to the state and local governments with jurisdiction over the Wyoming site.</p>

Table 7.11 (continued)

Site A in Skull Valley with a new rail line (i.e., the proposed action)	Alternative site in Wyoming ^a
Land Use	
<p>SMALL TO MODERATE. Impacts to land use for construction of the proposed facility would be expected to be quantitatively small (since a small proportion of the total land of the Reservation and an even smaller proportion of land within Skull Valley would be altered), even if the change would be qualitatively different. Construction of the proposed rail line, however, could result in reduced availability of grazing resources, including access to livestock watering resources, during both construction and more particularly during operation.</p>	<p>The Wyoming site is located in a remote, sparsely populated area. The impacts to land use of constructing and operating a facility at the Wyoming site are expected to be less than those at the remote Skull Valley site because of fewer land requirements for transporting SNF from the railroad mainline to a storage facility.</p>
Cultural Resources	
<p>SMALL TO MODERATE. The Cooperating Federal Agencies have determined that activities associated with construction of the Skunk Ridge rail line would adversely affect parts of eight historic properties that have been evaluated as being eligible for inclusion on the <i>National Register</i>. Impacts to sections of these sites that lie within the rail right-of-way corridor will be mitigated prior to construction. During construction, temporary barricades will be constructed along the edge of the right-of-way at each historic property to prevent inadvertent loss of integrity to the portions of the properties being preserved outside the rail corridor. Construction activities for the rail line are considered to have a moderate impact on cultural resources. Operation of the rail line would have a small impact.</p> <p>No traditional cultural properties important to Federally Recognized Indian Tribes or culturally important natural resources have been documented at the site or along the proposed rail corridor. Consequently, construction and operation of the proposed PFSF is considered to have a small potential for impacting such resources or cultural values.</p>	<p>Although equivalent archaeological, historic, and Native American cultural resource studies have not been conducted at the Wyoming site, it is believed, based on the site file and literature reviews, that impacts to cultural resources would be similar to or less than those for a facility in Skull Valley. The fact that a lengthy rail access is not required generally reduces the potential for adverse impacts to cultural resources.</p>

Table 7.11 (continued)

Site A in Skull Valley with a new rail line (i.e., the proposed action)	Alternative site in Wyoming ^a
Human Health (Excluding SNF Transportation Impacts)	
Non-radiological impacts to workers. SMALL. Occupational accidents during construction and operation of the proposed PFSF and rail line would be expected to result in no fatal injuries and possibly 92 nonfatal injuries associated with lost workdays during the 40-year life of the facility.	The impacts to workers for a facility in Wyoming would be similar to those for a facility in Skull Valley. The primary differences would be related to a shorter length of rail line being constructed in Wyoming.
Radiological doses to members of the public. SMALL. The estimated annual dose to a hypothetical individual at the boundary of the storage area would be no more than 0.0585 mSv (5.85 mrem). This is about 2 percent of the dose from natural background radiation in the United States and is well within the 0.25 mSv/yr (25 mrem/yr) limit established by NRC regulations. The dose to the nearest resident would be no more than 3.56×10^{-4} mSv/yr (0.0356 mrem/yr).	The impacts to the public for a facility in Wyoming would be similar to those for a facility in Skull Valley. However, there is a larger population near the Wyoming site and the nearest residence is closer than in Skull Valley. The dose to the nearest resident would be about 0.02 mSv/yr (2 mrem/yr), which is well within NRC regulatory limits.
Radiological doses to workers. SMALL. The average individual dose to workers engaged in SNF transfer operations at the proposed PFSF is estimated as 0.0433 Sv/yr (4.33 rem/yr) which is within the NRC's regulatory limit of 5 rem/yr for workers.	The impacts to workers for a facility in Wyoming would be similar to those for a facility in Skull Valley.
Human Health from Transportation of SNF	
Incident-free transportation. SMALL. The potential impacts for moving SNF by rail to the proposed PFSF are estimated to be no greater than the equivalent of a latent cancer fatality (LCF) of 0.0918 among members of the public along the rail routes for the 20-year campaign of SNF shipments to the facility. The train crew would receive a dose no greater than the equivalent of an LCF risk of 0.00976.	The annual impacts of shipping SNF by rail to the Wyoming site are estimated to be no greater than the equivalent of an LCF risk of 0.0854 for members of the public along the rail routes for the 20-year campaign of SNF shipments to the facility. The train crew would receive an annual dose no greater than the equivalent of an LCF risk of 0.00904.
Non-radiological accidents during transportation. SMALL. The statistical number of vehicle-related accidents associated with the shipment of SNF by rail to Skull Valley is estimated to result in 1.48 injuries and 0.78 fatalities over the assumed 40-year lifetime of the proposed facility.	The statistical number of vehicle-related accidents during shipments to the Wyoming site is estimated to result in 1.72 injuries and 0.92 fatalities over the assumed 40-year lifetime of the ISFSI.
Radiological accidents during transportation. SMALL. The potential impacts of accidents during the shipment of SNF by rail to the proposed PFSF are estimated to be no greater than the equivalent of an LCF risk of 0.0423 among members of the public along the rail routes for the 20-year campaign of SNF shipments to the facility.	The potential impacts of accidents during the shipment of SNF by rail to the Wyoming site are estimated to be no greater than the equivalent of an LCF risk of 0.0365 among members of the public along the rail routes for the 20-year campaign of SNF shipments to the facility.

Table 7.11 (continued)

Site A in Skull Valley with a new rail line (i.e., the proposed action)	Alternative site in Wyoming ^a
Environmental Justice	
SMALL. There are no disproportionately high and adverse impacts on low income or minority populations. All adverse effects that might disproportionately affect low income or minority populations would be small. Members of the Skull Valley Band would benefit from the proposed PFSF lease payments and employment.	Because this site is not on Tribal trust land, the local Native American community would not benefit from lease payments, although members of local tribes might benefit from employment because of the facility. There are no disproportionately high and adverse impacts on low income or minority populations.
Noise	
SMALL. Noise from large-scale construction would be discernable, although probably not annoying, at outdoor locations near the nearest resident. Construction of a rail line near Interstate 80 would not add appreciably to existing noise levels within passing vehicles. Noise from operation would arise primarily from locomotives transporting casks through Skull Valley to the proposed PFSF. Because the proposed new rail line is on the western side of the Valley, and away from the populated eastern side, and because trains are infrequent (two trains per week) the noise is not expected be annoying.	There are no discernable differences between noise impacts at the Wyoming sites and the Skull Valley sites. Noise from construction and operation would occur closer to more people at the Wyoming site, but background noise is already higher there due the greater amount of human activity and the existing rail line usage close to the alternative site.
Scenic Qualities	
MODERATE. Construction and operation would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. This change would represent small to moderate impacts to recreational viewers, residents of Skull Valley, and motorists traveling Skull Valley Road and Interstate 80.	Visual impacts for a facility in Wyoming would be similar to those of a facility in Skull Valley. Visual impacts of transportation facilities would be less for the Wyoming site because the rail line would be shorter than in Skull Valley.
Recreation	
SMALL. There may be some delays or inconvenience to users wishing access to recreational resources and opportunities, particularly during construction, when access to these resources in Skull Valley would be adversely affected by the movement of construction materials and workers on Skull Valley Road. Impacts to recreational resources and opportunities would be smaller during operations.	The Wyoming site is located in a remote, sparsely populated area, and the impacts to recreation of constructing and operating a facility at the Wyoming site are expected to be similar to or less than those at the remote Skull Valley site due to the much shorter rail line.

^aThe Wyoming site has been compared to the proposed site (i.e., Site A in Skull Valley) only to determine if it is obviously superior to the Skull Valley site selected by PFS.